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NATIONAL DAM SAFETY PROGRAM. BEAR SWAMP LAKE DAM NUMBER 1 (NJ00--ETC(U)
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LEVEL III

PASSAIC RIVER BASIN

BEAR SWAMP BROOK, PASSAIC COUNTY

NEW JERSEY

BEAR SWAMP LAKE
DAM NO. 1

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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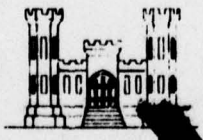

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE - 2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

AUGUST 1978

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
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Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

26 SEP 1978

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Bear Swamp Lake Dam No. 1 in Passaic County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Bear Swamp Lake Dam No. 1, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition. The spillway is considered inadequate since 35 percent of the Probable Maximum Flood (PMF) would overtop the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The adequacy of the spillway for this lake (located at Dam No. 2) should be determined by a qualified professional consultant, engaged by the owner, using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1979.

b. Within six months from the date of approval of this report a program should be implemented to regularly observe seepage.

c. Within one year from the date of approval of this report, the following actions should be taken:

(1) Brush and vines growing on the downstream face, and rotted vegetation at the tow should be removed and kept clean.

NAPEN-D
Honorable Brendan T. Byrne

(2) Areas of deteriorated and spalled concrete should be cleaned and patched annually to prevent progressive damage.

(3) The low level outlet should be tested to see if it is operable and made operable if it is not.

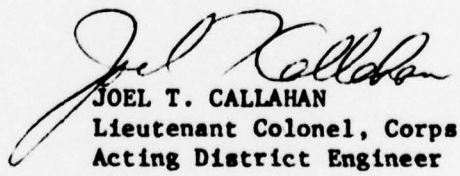
(4) A program of regular inspection and maintenance should be implemented.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Robert A. Roe of the Eighth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia, 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely yours,



JOEL T. CALLAHAN
Lieutenant Colonel, Corps of Engineers
Acting District Engineer

1 Incl
As stated

Cy furn:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N. J. Dept. of Environmental Protection
P.O. Box 2809
Trenton, NJ 08625

BEAR SWAMP LAKE DAM NO. 1 (NJ00016)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 27 June and 6 July 1978 by Harris-ECI under contract to the State of New Jersey. The state, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

The Bear Swamp Lake Dam No. 1, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition. The spillway is considered inadequate since 35 percent of the Probable Maximum Flood (PMF) would overtop the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The adequacy of the spillway for this lake (located at Dam No. 2) should be determined by a qualified professional consultant, engaged by the owner, using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1979.

b. Within six months from the date of approval of this report a program should be implemented to regularly observe seepage.

c. Within one year from the date of approval of this report, the following actions should be taken:

(1) Brush and vines growing on the downstream face, and rotted vegetation at the tow should be removed and kept clean.

(2) Areas of deteriorated and spalled concrete should be cleaned and patched annually to prevent progressive damage.

(3) The low level outlet should be tested to see if it is operable and made operable if it is not.

(4) A program of regular inspection and maintenance should be implemented.

DATE: 26 September 1978 APPROVED: Joel T. Callahan

JOEL T. CALLAHAN
Lieutenant Colonel, Corps of Engineers
Acting District Engineer

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Bear Swamp Lake Dam #1, I.D. NJ00016
State Located:	New Jersey
County Located:	Passaic
Stream:	Bear Swamp Brook
Date of Inspection:	June 27, and July 6, 1978

Assessment of General Condition

The general condition of Bear Swamp Lake Dam #1 is good.

Two dams, Bear Swamp Lake Dams #1 and #2, from Bear Swamp Lake (also known as Arcadia Lake). The spillway for this lake is located at Bear Swamp Lake Dam #2. Because this spillway does not have the capacity to pass the PMF or even one-half the PMF, the general safety of Bear Swamp Lake Dam #1 is considered questionable, even though overtopping of the dam would cause only minor damage downstream. The spillway at Bear Swamp Lake Dam #2 is capable of passing a flood equal to 34 percent of the PMF.

At present the engineering data available is not sufficient to make a definitive statement on the stability of the dam.

The following remedial actions, however, are suggested along with a timetable for their completion.

1. Studies to augment the spillway discharge capacity should be undertaken within six months.

2. A program for regularly observing seepage should be implemented within six months.

Furthermore, while of a less urgent nature, the following additional actions are recommended and should be carried out within a reasonable period of time.

1. Brush and vines growing on the downstream face, and rotted vegetation at the toe should be removed and kept clean.

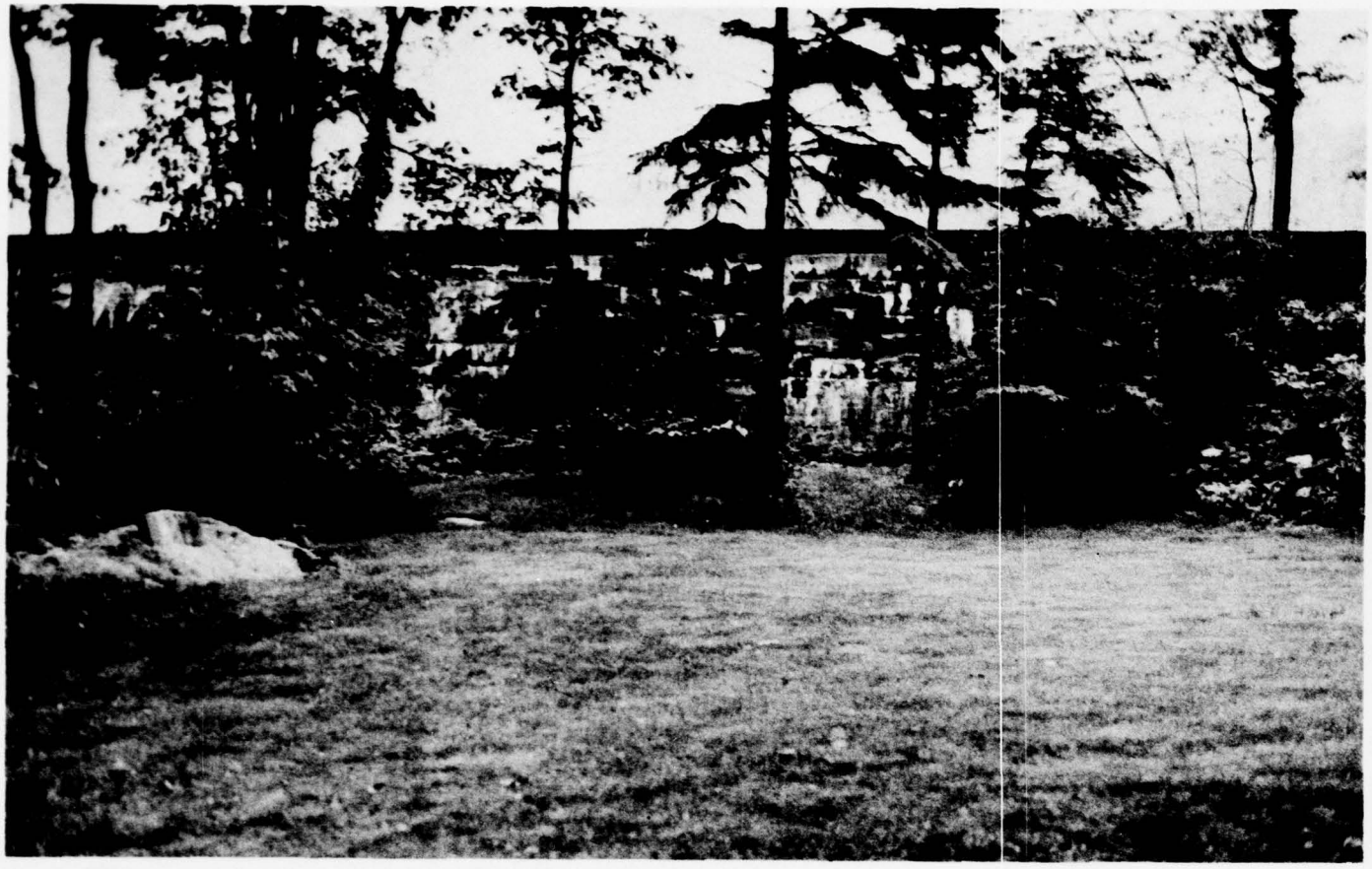
2. Areas of deteriorated and spalled concrete should be cleaned and patched annually to prevent progressive damage.

3. The low level outlet should be tested to see if it is operable and made operable if it is not.

4. A program of regular inspection and maintenance should be implemented.

Robert Gershowitz, P.E.

Robert Gershowitz, P.E.



BEAR SWAMP DAM #1

June 27, 1978

View of dam from downstream.

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ASSESSMENT OF GENERAL CONDITION

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PLATES

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

BEAR SWAMP LAKE DAM #1, ID. NJ00016

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The National Dam Inspection Act (Public Law 92-367, 1972) provides for the National Inventory and Inspection Program by the U.S. Army Corps of Engineers. This inspection was made in accordance with this authority under Contract C-FPM No. 35 with the State of New Jersey who, in turn, is contracted to the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspection of the Bear Swamp Lake Dam #1 was made on June 27, and July 6, 1978. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam structure and its appurtenances.

c. Scope of Report

This report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the Field Inspection; presents an evaluation of hydrologic and hydraulic conditions at the site; presents an evaluation as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

1.2 Description of Project

a. Description of Dam and Appurtenances

Bear Swamp Lake Dam #1 is a mass concrete structure with a maximum height of about 15 feet. Section dimensions were obtained by field measurements. The crest width is 3.5 feet; upstream face slopes back at 1 horizontal to 4 vertical; downstream face is vertical from the crest down for the first 2 feet, then slopes outward 1 horizontal to 1.5 vertical. The dam axis consists of two straight sections which angle off near the mid-point of the dam at an interior angle of approximately 154^{o}-$20'$. The total length of the dam is 315 feet. Freeboard at the time of the inspection was about 1.3 feet.

The dam was constructed around 1926, on what is now the southern end of Bear Swamp Lake. Bear Swamp Lake Dam #1 was not constructed with a spillway, rather, the spillway facility for Bear Swamp Lake is located on Bear Swamp Lake Dam #2, which was constructed on the western side of the lake. In 1971, new concrete facing was placed on the upstream side of the Bear Swamp Lake Dam #1.

Bedrock outcrops occur in both abutments and it is believed that the dam is founded on bedrock.

A concrete valve chamber is located at the base of the downstream face about 112-feet from the right abutment. The chamber contains a 6-inch non-rising stem manually operated gate valve which releases into an 8-inch diameter clay tile outlet pipe. The outlet pipe discharges over bedrock a short distance from the chamber. This outlet could help drawdown the reservoir in an emergency, although it is not known if the outlet is operable.

b. Location

Bear Swamp Lake Dam #1 is located in Passaic County, New Jersey. It is accessible by way of a private road from where Carmantown and Otterhole Roads join. The damsite is surrounded by private property with roadway access to the left abutment.

c. Size and Hazard Classification

Bear Swamp Lake Dam #1 is classified in the dam size category as being "intermediate", since its storage is less than 50,000 acre-feet, but may be slightly more than 1,000 acre-feet. Its size classification based on height would be "small" since its height is less than 40 feet, but the larger size category governs. Since failure of the dam is not likely to cause extensive loss of life or excessive property damage, a hazard potential classification of "significant" has been assigned to the project. The dam was initially rated as "high" hazard, but was downgraded after the field inspection revealed that overtopping of the dam would cause little damage downstream.

d. Ownership

Bear Swamp Lake Dam #1 is owned by the Lake Arcadia Association, Otterhole Road, West Milford, New Jersey, 07480; Attention: Mr. James A. Hosford, Chairman.

e. Purpose of Dam

The lake is used only for recreation, mostly swimming, boating and fishing.

f. Design and Construction History

No original drawings of the dam were available. No computations for the design of the original structure were available. No records were available on the construction of the dam or any repairs that were made to the structure after original construction.

g. Normal Operational Procedures

The discharge from the lake is normally unregulated, however, the water level in the lake is very stable. It was reported that the water level is lowered 15 to 18 inches each fall, usually in late October. The water level is allowed to return to its normal level each spring.

1.3 Pertinent Data

a. Drainage Area - 0.40 square miles

b. Discharge at Damsite

Maximum known flood at damsite	N.A.
Warm water outlet at pool elevation	N.A.
Diversion tunnel low pool outlet at pool elevation	N.A.
Diversion tunnel outlet at pool elevation	N.A.
Gated spillway capacity at pool elevation	N.A.
Gated spillway capacity at maximum pool elevation	N.A.
Ungated spillway capacity at maximum pool elevation	No Spillway
Total spillway capacity at maximum pool elevation	No Spillway

c. Elevation (Feet above MSL)

Top of dam	886.33
Maximum pool-design surcharge	886.33
Full flood control pool	N.A.
Recreation pool	885
Spillway crest	No Spillway
Upstream portal invert diversion tunnel	N.A.
Downstream portal invert diversion tunnel	N.A.
Streambed at centerline of dam	864 $\pm$
Maximum tailwater	N.A.

d. Reservoir

Length of maximum pool	3,650 feet (Estimated)
Length of recreation pool	3,590 feet (Estimated)
Length of flood control pool	N.A.

e. Storage (Acre-Feet)

Recreation pool	900 acre-feet (El. 885)
Flood control pool	N.A.
Design surcharge	1,000 acre-feet (El. 886.33)
Top of dam	1,000 acre-feet (El. 886.33)

f. Reservoir Surface (Acres)

Top of dam	86.4 acres (El. 886.33)
Maximum pool	86.4 acres (El. 886.33)
Flood control pool	N.A.
Recreation pool	64 acres (El. 885)
Spillway crest	N.A.

g. Dam

Type	Straight Concrete Gravity
Length	315 feet
Height	15 feet
Top width	3.5 feet
Side slopes - Upstream	1 horizontal to 4 vertical
- Downstream	1 horizontal to 1-1/2 vertical

Zoning	N.A.
Impervious core	N.A.
Cutoff	N.A.
Grout curtain	None

h. Diversion and Regulating Tunnel (N.A.)

i. Spillway

Type	No Spillway
Length of weir	N.A.
Crest elevation	N.A.
Gates	N.A.
Upstream channel	N.A.
Downstream channel	N.A.

j. Regulating Outlets

8-inch tile conduit controlled by 6-inch gate valve.

SECTION 2: ENGINEERING DATA

2.1 Design

No drawings or computations pertaining to original construction, modification or repair of the dam could be found. No foundation borehole or geologic investigation data could be found. The design strength for the mass concrete is unknown.

2.2 Construction

No records have been found and the owner's representative has no knowledge of the construction history of the dam.

2.3 Operation

No records of operation of the lake are kept by the owner. The only operating rule is to lower the lake each fall to protect boat docks during the winter. Otherwise, the lake is allowed to operate naturally without regulation.

2.4 Evaluation

a. Availability

No engineering data was available for the original section or the repairs to the dam.

b. Adequacy

While the engineering data was insufficient to perform a comprehensive, definitive evaluation of the dam's stability, an adequate assessment of the dam could be carried out with the data obtained in the field in view of the overall good condition of the dam.

c. Validity

Not applicable, as no design or construction records were available.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The visual inspection made of Bear Swamp Lake Dam #1 did not reveal any signs of distress in the dam. No structural cracking was observed. The dam appeared to be in reasonably good condition with minimally adequate maintenance.

b. Dam

Considerable concrete spalling was observed on the downstream face of the dam. The upstream face of the dam was resurfaced with 4 to 6 inches of concrete, reportedly around 1971. There was no evidence of structural cracking. Construction and monolith joints appeared to be tight and basically in good condition. Some minor seepage had occurred through construction joints as evidenced by leaching, however, no flowing seepages were observed. There were no indications of either horizontal or vertical movement of the structure.

Bedrock outcrops of gneiss occur on both abutments and rim of the reservoir. The gneiss is moderately jointed (spacing 1 to 2 feet) to massive (joints spaced greater than 3 feet). The rock is relatively unweathered and hence, is an excellent foundation for the dam. The joints in the outcrop appear relatively tight, which suggest minimum under-dam and reservoir seepage losses.

Concrete to rock abutment contacts appeared to be basically good. However, some minor deterioration of concrete was observed at one contact point with the left abutment.

One seep was observed in a gully near the right abutment, approximately 25 feet downstream of the dam. Seepage was estimated to be 2 to 3 g.p.m. and was flowing clean.

c. Appurtenant Structures

Low Level Outlet

A concrete valve vault is located at the toe of the downstream side of the dam. The vault extends about 1 foot below ground surface and contains a single 6 inch non-rising stem manually operated gate valve. The valve is located in a line extending into Bear Swamp Lake. The outlet is an 8 inch diameter clay tile pipe which discharges over bedrock a short distance from the vault. The valve is rarely used and has not been operated for approximately 3 years prior to this inspection, as estimated by the caretaker. The intake was submerged at the time of the inspection and, thus, could not be inspected.

d. Reservoir Area

The reservoir rim is gently sloped and no indications of instability were readily apparent. The slopes above the reservoir are heavily wooded. No buildings or dwellings are built on or near the shoreline, but a few boat docks are

on the shoreline. The property around the lake is privately owned and it was reported that access to the lake is limited to members of the Lake Arcadia Association.

e. Downstream Channel

No downstream channel, as such, is associated with this dam because all spillway discharges and normal low level outlet releases occur at Bear Swamp Lake Dam #2.

3.2 Evaluation

Based on the visual inspection the dam appears to be functioning adequately. Some maintenance is in order and recommendations are presented in subsequent sections. The impoundment slopes show no apparent signs of instability and are not believed a potential hazard to the dam.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

Bear Swamp Lake Dam #1 is used to impound water for recreation activities. The policy is to maintain a nearly constant lake level. The lake level is normally maintained by unregulated discharge over the spillway at Bear Swamp Lake Dam #2 on the west side of the lake.

The lake level is lowered each fall by releasing water through the outlet pipe in Bear Swamp Lake Dam #2. The lake is usually lowered about 15 to 18 inches below the normal level during the winter and is allowed to refill naturally in the early spring.

4.2 Maintenance of the Dam

There is no program of regular inspection and maintenance of the dam and appurtenant structures. Operation and maintenance is done by Mr. James Carter, caretaker for the Lake Arcadia Association, as a part of his duties. At present, no records of operation and maintenance are kept.

4.3 Maintenance of Operating Facilities

The low level outlet gate valve has not been opened since Mr. Carter has been caretaker. No known maintenance of the valve has been made to keep the valve operable. The outlet pipe has not received maintenance.

4.4 Evaluation

Surveillance and maintenance is in the hands of the Lake Arcadia Association caretaker. A formalized program of periodic inspection by an experienced party should be initiated and documentation recorded to assist the owner. A program of periodic maintenance should also be implemented.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

The drainage area above Bear Swamp Lake Dam #1 and #2 is approximately 0.40 square miles. The drainage area was delineated from U.S.G.S.'s topographic maps. There are two dams which impound water in the Bear Swamp Lake; one is located at the south end of the lake, named Bear Swamp Lake Dam #1 and the other is located to the northwest of Dam #1 and is named Bear Swamp Lake Dam #2. A drainage map of the watershed of Bear Swamp Lake Dams #1 and #2 is presented on Plate 1, Appendix D. Both the Bear Swamp Lake Dam #1 and Dam #2 form the same reservoir. However, the spillway is located on Bear Swamp Lake Dam #2.

The topography within the basin varies from foothills type terrain in the southeast section, to generally hilly in the northwest section. Elevations range up to approximately 1,040 feet above mean sea level in the hills at the east end of the watershed to about 880 feet at the damsite.

The land use pattern within the watershed is mostly forest. The forested lands are along the hilly sections of the watershed. About twenty percent of the watershed area is the reservoir of the dam.

The evaluation of the hydraulic and hydrologic features of the dam was based on criteria set forth in the Corps of Engineers "Recommended Guidelines for Safety Inspection of Dams", and additional guidance provided by the Philadelphia District, Corps of Engineers. The Probable Maximum Flood (PMF) was calculated from the Probable Maximum Precipitation (PMP) using Hydrometeorological Report No. 33 with standard reduction factors. Due to the small drainage area of Bear Swamp Lake Dam #1, the SCS triangular hydrograph, transformed to a curvilinear hydrograph, was adopted for developing the unit hydrograph. The derived unit hydrograph is presented in Appendix D.

Initial and infiltration loss rates were applied using SCS procedure to the PMP to obtain rainfall excesses. The rainfall excesses were then applied to the unit hydrograph to obtain the PMF hydrograph utilizing the Corps of Engineers' computer program HEC-1. The computed peak discharges of the PMF and one-half of the PMF are 2,379 cfs and 1,189 cfs, respectively.

Both the PMF and one-half the PMF inflow hydrographs were routed through the reservoir by the Modified Puls Method, utilizing the same computer program HEC-1. The spillway and overtopping discharge rating curve of Bear Swamp Lake Dam #2 were combined with overtopping discharge rating curve of Bear Swamp Lake Dam #1 for the flood routing. The peak outflow discharges for the PMF and one-half the PMF for the two dams are 1,586 cfs and 365 cfs, respectively. Both the PMF and one-half the PMF result in overtopping of both Dam #1 and Dam #2.

The spillway and overtopping discharge rating curves of the dams were prepared assuming free overflow across the whole length of the dams and the spillway. The reservoir stage-capacity data were based on the U.S.G.S. quadrangle topographic maps in combination with data given in the National Dam Safety Inventory Table. Reservoir storage capacity included surcharge levels exceeding the top of the dam. The spillway and overtopping rating curves and the combined spillway and overtopping rating curves of both the dams were prepared assuming the dams remain intact during routing. In the routing computations, the discharge through outlet facilities of the dams were excluded due to its insignificant magnitude as compared to the PMF. The overtopping discharge rating curve of Dam #1, the spillway and overtop discharge rating curve of Dam #2, and the combined spillway and overtopping rating curves of the two dams are presented in Plates 2, 2A and 2B, The reservoir capacity curve is also presented in Plate 3 of Appendix D.

b. Experience Data

No records of lake levels are maintained for this site. There is no spillway at the site and all lake discharges are made at Bear Swamp Lake Dam #2. The lake level is normally stable and no reports or evidence was found that the dam has ever been overtopped.

c. Visual Observations

There is no spillway or defined discharge channel downstream of the dam. The valley below the dam is heavily wooded with much debris. There is one dwelling downstream of the dam on the left side but there are few other dwellings and no new urbanization in the lake area. The slopes around the

lake are gently sloping and heavily wooded. There is little evidence of sedimentation in the lake.

d. Overtopping Potential

As indicated in Section 5.1-a., both the Probable Maximum Flood and one-half the Probable Maximum Flood, when routed through the Bear Swamp Lake reservoir result in overtopping of the dam. The PMF and one-half the PMF overtopped the dam by 1.07 feet and 0.32 feet, respectively. In determining the overtopping heights it was assumed that both the dams remain in their present condition, such that outflow occurs over both the dams during the floods, according to the existing structural dimensions of the dams. Since one-half the PMF is the minimum Spillway Design Flood (SDF) for this dam, according to the Recommended Guidelines for Safety Inspection of Dams by the Corps of Engineers, the spillway capacity of the Bear Swamp Lake Dam #1 is considered inadequate even though the dam can withstand overtopping and the damage downstream would be minimal.

e. Reservoir Drawdown

The reservoir drawdown below the spillway crest, elevation 885, is accomplished by permitting discharge simulataneously through the 8-inch tile pipe under Dam #1 and the 12-inch cast iron pipe under Dam #2. The hydraulic calculations were performed by assuming invert elevations and dimensions as shown on the calculation sheets presented in Appendix D. The tailwater was assumed to correspond to the top of the conduit and kept constant at that level for the purpose of drawdown calculation. This resulted in a maximum head differential of 13.67 feet for the outlet pipe in Dam #1 and 15.67 feet for the outlet pipe in Dam #2. Assuming a constant

inflow of 0.80 cfs (2 cfs/sq. mi.), the total drawdown time is 39 days and 6 hours, at which point the reservoir pool is at elevation 870.33 feet. Assuming zero inflow, the drawdown to elevation 870.33 can be accomplished in 35 days and 7 hours.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

At the time of the inspection, the dam did not exhibit any visible signs of distress. No structural cracks in the concrete could be found and there was no evidence of tilting, misalignment or movement on the foundation. The dam appears to be founded on competent rock. The surface spalling and deterioration of concrete does not affect the structural strength or stability. Based on a visual inspection, and in view of more than 50 years of satisfactory past performance, the structure appears to be stable.

b. Design and Construction Data

No design or construction data was available.

c. Operating Records

No operating records were available.

d. Post-Construction Changes

As discussed in Section 1.2, the only known post-construction change was the placing of 4 to 6 inches of concrete facing on the upstream face of the dam.

e. Static Stability

The depth to the base of concrete, as well as the shape and dimensions of the section, and the nature and strength parameters of the foundation will profoundly influence the stability of the dam. Also, ice loads during the winter could be significant, depending on the climate and reservoir restraint. None of this information is presently available. Therefore, it is not possible to make a definitive statement on the stability of the concrete section. Stability calculations are contained in Appendix E.

f. Seismic Stability

A north-south trending fault about 1/3 mile east of the dam has been mapped by others. The dam is located in Seismic Zone 1, as defined in Recommended Guidelines For Safety Inspection of Dams as prepared by the Corps of Engineers. In general, projects located in Seismic Zones 0, 1 and 2 may be assumed to present no hazard from earthquake, provided the static stability conditions are satisfactory and conventional safety margins exist.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety

The dam has been inspected visually and a review has been made of the available engineering data. This assessment is subject to the limitations inherent in the visual inspection procedures stipulated by the Corps of Engineers for Phase I Reports.

The safety of Bear Swamp Lake Dam #1 is in question because the dam does not have a spillway and there is inadequate capacity in the spillway of Bear Swamp Lake Dam #2 to pass the PMF or one-half the PMF flood without overtopping both dams. However, overtopping the dams should cause only minor damage since the abutments and foundation are massive unweathered rock. The present spillway of Bear Swamp Lake Dam #2 can pass only about 34 percent of the PMF.

No definitive statement pertaining to the safety of the structure can be made without determination of the complete dimensions of the dam and acquisition of the engineering properties of the foundation. However, the present dam has performed adequately since it was built in 1926, without failure or evidence of instability.

b. Adequacy of Information

The information and data uncovered is not adequate to perform a comprehensive, definitive evaluation of the dam's stability. Nevertheless, in view of the past performance of the dam, its present condition, and in light of stability calculatiions performed (see Appendix E), it is not felt that additional information on the engineering properties of the embankment and foundation is necessary at this time. Nevertheless, it is believed desirable to have a survey of the dam made to determine the true shape and dimensions of dam structures in order to prepare drawings.

c. Urgency

Studies to augment the spillway discharge capacity should be made within six months, and a plan formulation should be completed within a 12-month period.

A program for regulary observing seepage should be implemented within six months.

7.2 Remedial Measures

a. Alternatives

The alternatives available for increasing the spillway capacity are:

1. Increasing the dam height, of both Bear Swamp Lake Dams, thus, permitting a higher discharge to pass over the Bear Swamp Lake Dam #2 without overtopping.

2. Providing for a spillway on the Bear Swamp Lake Dam #1 by notching the crest, adding a chute on the downstream face, hardening the toe area below the spillway and constructing a protected downstream discharge channel, all sufficient to withstand emergency flows of one-half PMF magnitude.

3. Increase the spillway capacity at Bear Swamp Lake Dam #2.

4. A combination of the above alternatives.

It must be emphasized that both dams must be modified at the same time for alternatives involving raising the dam.

7.3 Recommendations

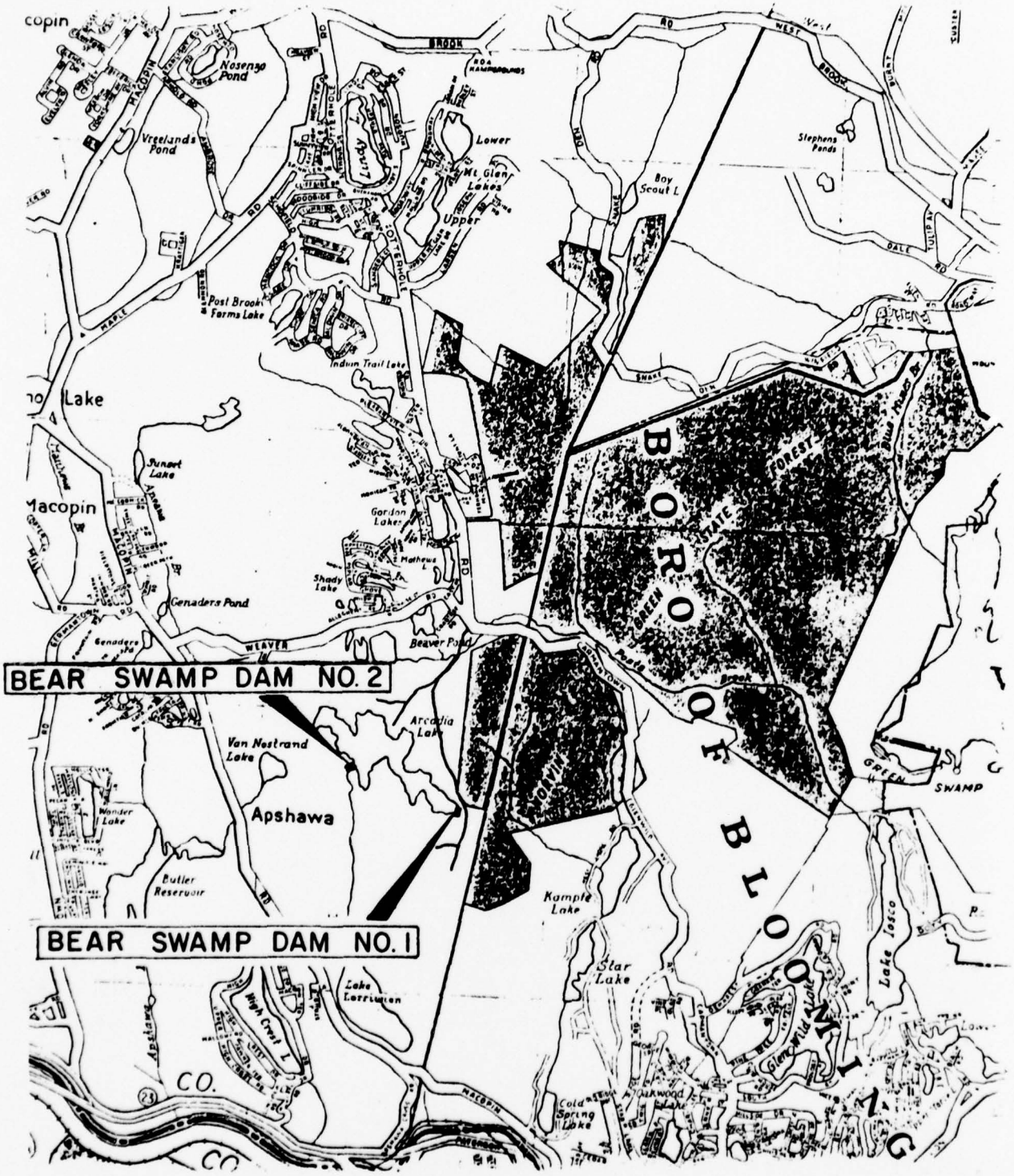
Based on the visual inspection and data evaluation presented herein, the following action is recommended.

Brush and vines growing on the downstream face, and rotted vegetation at the toe should be removed and kept clean.

Areas of deteriorated and spalled concrete should be cleaned and patched annually to prevent progressive damage.

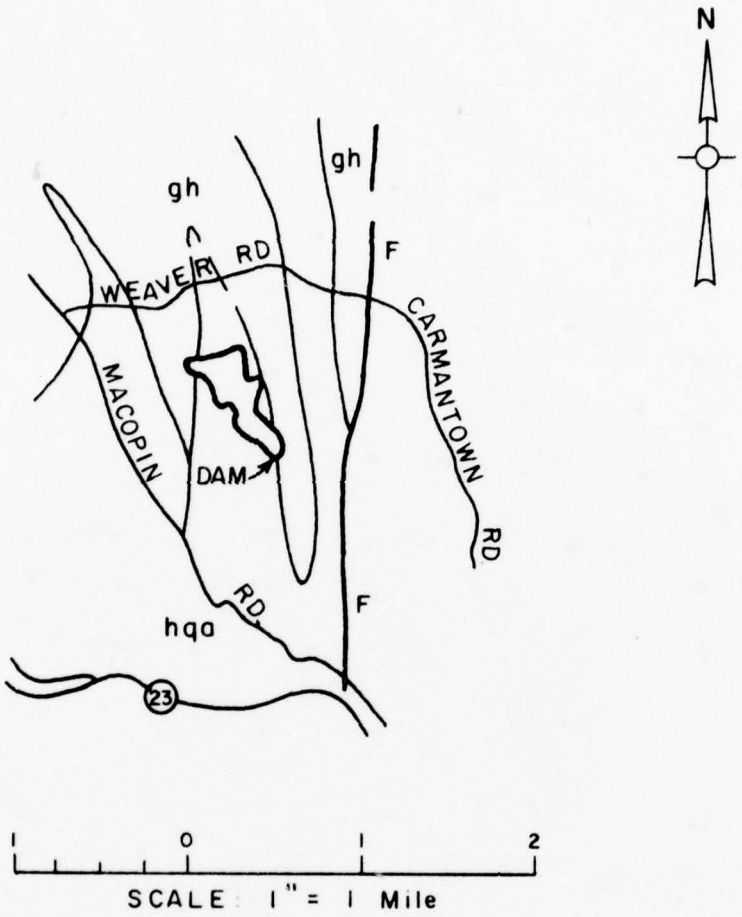
The low level outlet should be tested to see if it is operable and made operable if it is not.

PLATES



VICINITY MAP

PLATE 1



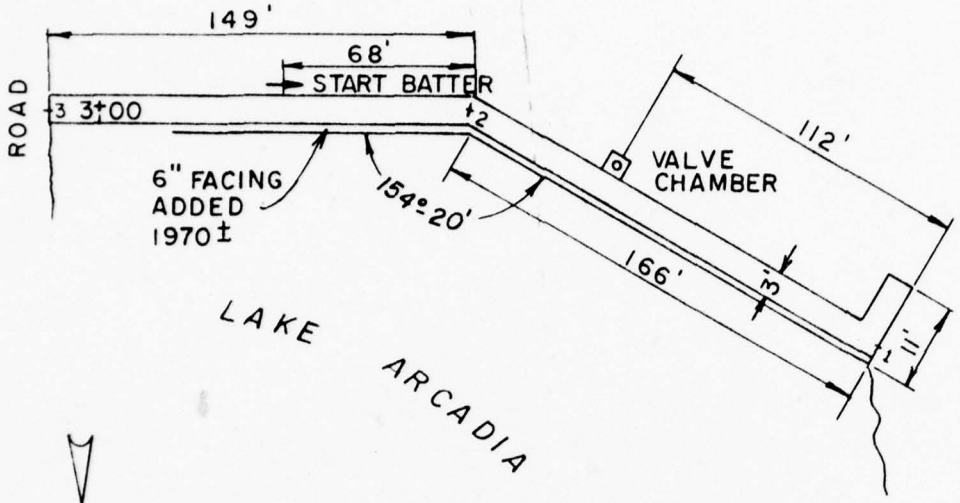
LEGEND

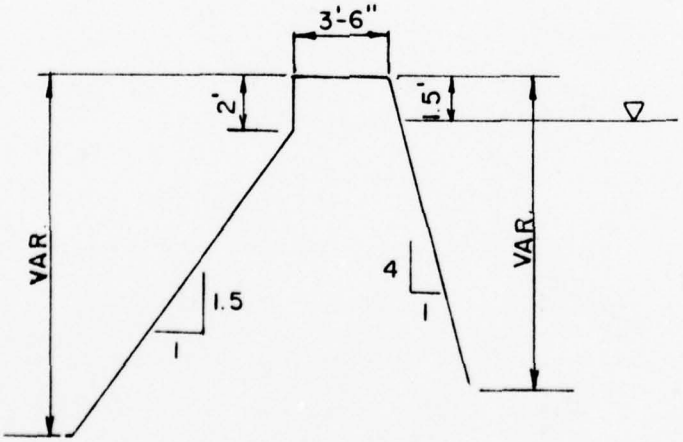
gh	MOSTLY HORNBLENDE GRANITE AND GNEISS
hqa	HYPERSTHENE - QUARTZ - ANDESINE GNEISS
F	FAULT

GEOLOGIC MAP
BEAR SWAMP DAM NO. 1

PLATE 2

STA.	ELEV.
1 0+00	100.00 (ASSUMED)
2 1+66	99.98
3 3+15	99.88





TYPICAL SECTION
0+00 TO 2+34

HARRIS - ECI - ASSOCIATES		
BEAR SWAMP LAKE DAM # 1		
FIELD INSPECTION SKETCH		
D.J.K	6-27-78	1 OF 1

PLATE 3

APPENDIX A

CHECK LIST - VISUAL OBSERVATIONS

CHECK LIST - ENGINEERING, CONSTRUCTION
MAINTENANCE DATA

CHECK LIST

Visual Inspection
Phase I

Name Dam Bear Swamp #1 County Passaic State New Jersey Coordinators _____

Date(s) Inspection June 27, 1978 Weather Cool-Clear Temperature 75°F
Rained the previous night.

Pool Elevation at Time of Inspection _____ M.S.L. Tailwater at Time of Inspection _____ M.S.L.
W.S. 16 inches below concrete crest.

Inspection Personnel:

(June 27, 1978)	(July 6, 1978)	(July 6, 1978)
Joe Sirianni	Yin Au-Yeung	Wm. Flynn
Henry King	Lynn Brown	
David Kerkes		

Robert B. Campbell Recorder

Owner Representative:

(June 27, 1978)

James Carter, Caretaker
Lake Arcadia Association

CONCRETE/MASONRY DAMS

Bear Swamp #1

Type - Straight Concrete Gravity Dam

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEEPAGE OR LEAKAGE	Minor seepage. Through construction joints as evidenced by leach deposits. No running seeps through concrete. Past repairs have been made by placing 4-6 inch thick slabs on reservoir face of dam. Seep or spring in bottom of gully approximately 30 feet downstream of toe of dam. Flow in stream at about 50 yards downstream estimated to be 2 to 3 gpm. All seepages are clear water.	Repair upstream face as in past to minimize seepage. Observe and record monthly condition of flow from downstream to detect changes in quantity or clarity of water.
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Both abutments are bedrock with no evidence of past erosion. Contact between concrete and rock foundation appears good.	
DRAINS	None - N.A.	
WATER PASSAGES	See Outlet Works.	
FOUNDATION	Leaves and rotted vegetation have piled up at the downstream toe apparently causing minor deterioration of concrete surface above contact between concrete and rock.	Rotting leaves and vegetation should be cleaned away from toe of dam annually. Surface spalls and deteriorated concrete should be removed and surfaces repaired.

CONCRETE/MASONRY DAMS

Bear Swamp #1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Minor spalling of concrete, especially downstream face. Small surface cracks on crest parapet. Upstream face has been resurfaced with 4'-6" concrete facing slab during 1970 through 1972 (dated on concrete) to stop seepages through cracks and/or construction cold joints. Face slabs appear to be quite effective and resisting damage well.	Inspect dam annually to detect new seepages and/or spalled areas. Apply face slabs or other waterproofing to upstream face whenever new seepages are found.
STRUCTURAL CRACKING	None can be found. Dam appears structurally sound.	
VERTICAL AND HORIZONTAL ALIGNMENT	No evidence of movement is apparent.	
MONOLITH JOINTS	Joints are tight and basically in good condition. Some surficial spalling of top and upstream face adjacent to joint.	Spalled areas should be cleaned of deteriorated concrete and repaired to stop progression of spalls.
CONSTRUCTION JOINTS	Basically tight. Very little evidence of seepage through joints.	

EMBANKMENT

Bear Swamp #1

Type - None

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	N.A.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	N.A.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	N.A.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	N.A.	
RIPRAP FAILURES	N.A.	

EMBANKMENT

Bear Swamp #1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	N.A.	
ANY NOTICEABLE SEEPAGE	N.A.	
STAFF AND GAGE RECORDER	N.A.	
DRAINS	N.A.	

OUTLET WORKS

Bear Swamp #1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	N.A.	
INTAKE STRUCTURE	Submerged and not visible. Can not be inspected.	
OUTLET STRUCTURE	Concrete vault with 8" clay tile pipe discharge from vault. Free fall outlet onto bedrock. No erosion of 8" C.I. gate valve in vault.	
OUTLET CHANNEL	Natural with no defined waterway. Area very heavily wooded.	
EMERGENCY GATE	None.	

UNGATED SPILLWAY

Bear Swamp #1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	N.A.	
APPROACH CHANNEL	N.A.	
DISCHARGE CHANNEL	N.A.	
BRIDGE AND PIERS	N.A.	

GATED SPILLWAY

(None)

Bear Swamp #1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N.A.	
APPROACH CHANNEL	N.A.	
DISCHARGE CHANNEL	N.A.	
BRIDGE AND PIERS	N.A.	
GATES AND OPERATION EQUIPMENT	N.A.	

INSTRUMENTATION

Bear Swamp #1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

RESERVOIR

Bear Swamp #1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slopes are stable and gently sloping away from lake	
SEDIMENTATION	Not much sediment inflow. Lake has no inlet stream and is reported by caretaker to be mostly spring fed. No evidence of sedimentation found.	
SHORELINE STRUCTURES	Few residences in area and all 10 or more feet above reservoir level except one just below and on left abutment of Bear Swamp #1 dam.	
USE	Recreation -- Mostly boating and fishing.	
OPERATION	Water level is held very uniform through summer. Reservoir drawn down 15 to 18 inches each fall, usually late October.	

DOWNSTREAM CHANNEL

Bear Swamp #1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Natural drainage way. No defined waterway. Heavily wooded. Much debris.	
SLOPES	Gently sloping rocky gulley.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	One residence well above drainage course.	

CHECK LIST
ENGINEERING DATA

DESIGN, CONSTRUCTION, OPERATION

Bear Swamp #1

ITEM	REMARKS
PLAN OF DAM	None available.
REGIONAL VICINITY MAP	Available.
CONSTRUCTION HISTORY	None available. Owner's representative reported the dam was built in about 1926.
TYPICAL SECTIONS OF DAM	None available.
HYDROLOGIC/HYDRAULIC DATA	None available.
OUTLETS - PLAN	)
- DETAILS	) None Available.
- CONSTRAINTS	)
- DISCHARGE RATINGS	)
RAINFALL/RESERVOIR RECORDS	None Available.

CHECK LIST
ENGINEERING DATA

DESIGN, CONSTRUCTION, OPERATION
(Continued)

Bear Swamp #1

ITEM	REMARKS
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available.
POST-CONSTRUCTION SURVEYS OF DAM	None available.
BORROW SOURCES	Unknown.
SPILLWAY - PLAN - SECTIONS - DETAILS	None available.

CHECK LIST
ENGINEERING DATA

DESIGN, CONSTRUCTION, OPERATION
(Continued)

Bear Swamp #1

ITEM	REMARKS
OPERATING EQUIPMENT PLANS AND DETAILS	) None available.)
MONITORING SYSTEMS	None available.
MODIFICATIONS	Repairs to upstream facing were made in 1971.
HIGH POOL RECORDS	None available.
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available.
PRIOR ACCIDENTS OR FAILURE OF DAM - DESCRIPTION - REPORTS	No reports of accidents or failure were found during the investigation.
MAINTENANCE, OPERATION RECORDS	None available.

APPENDIX B

PHOTOGRAPHS

All photos were taken on June 27, 1978.

Photo 1 - View of dam from downstream.

Photo 2 - View of dam from upstream left shoreline.

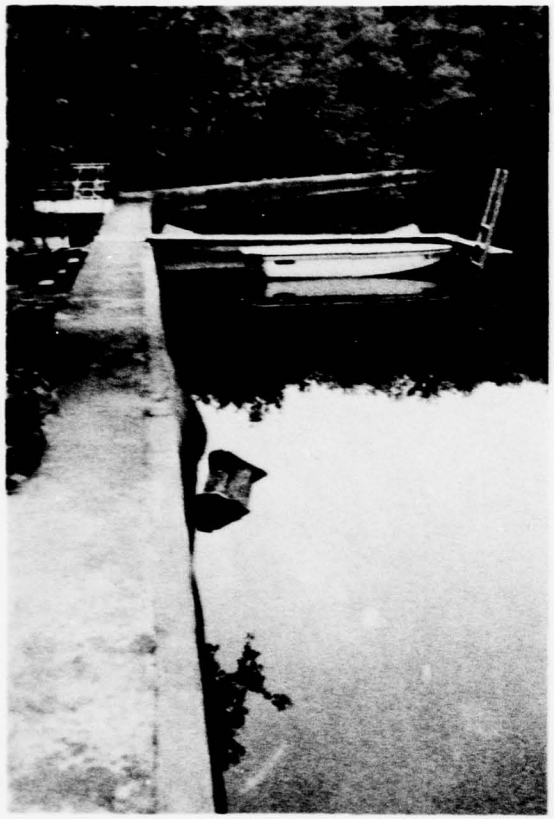


Photo 3 - View of dam crest from left abutment showing repair slab on upstream.

Photo 4 - View of downstream face and valve chamber showing leakage deposits.

Photo 5 - View of downstream face showing vegetation growing on face.

Photo 6 - Deterioration of concrete on downstream face.

Photo 7 - Concrete spalling on downstream face.

Photo 8 - Concrete spalling and deterioration at monolith joint.

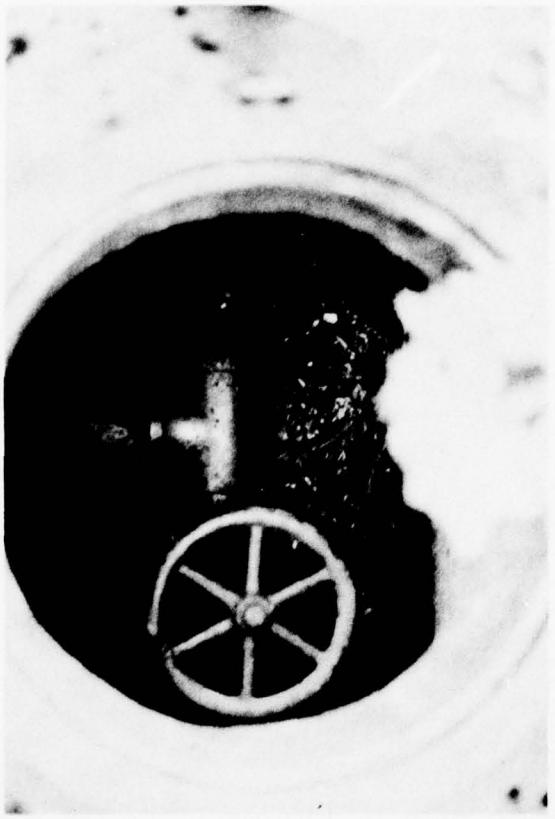


Photo 9 - Gate valve in vault on low level outlet works.

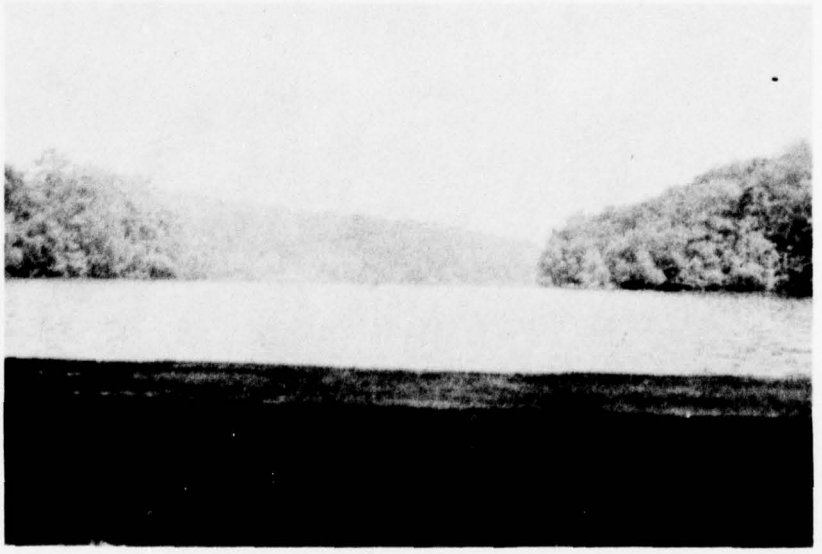


Photo 10 - View of Bear Swamp Lake and shoreline.

APPENDIX C

SUMMARY OF ENGINEERING DATA

CHECK LIST

HYDROLOGIC AND HYDRAULIC DATA

ENGINEERING DATA

Name of Dam: Bear Swamp Lake Dam #1

Drainage Area: 0.40 square miles

Elevation Top Normal Pool (Storage Capacity): 885 (900 AF)

Elevation Top Flood Control Pool (Storage Capacity): Not applicable

Elevation Maximum Design Pool: 886.33

Elevation Top of Dam: 886.33

SPILLWAY CREST: (None - Spillway is located at Bear Swamp Lake Dam #2)

a. Elevation: _____

b. Type: _____

c. Width: _____

d. Length: _____

e. Location Spillover: _____

f. Number and Type of Gates: _____

OUTLET WORKS:

a. Type: 8-inch tile conduit

b. Location: 112 feet to the left of right end of dam

c. Entrance Inverts: Not applicable

d. Exit Inverts: Not applicable

e. Emergency Draindown Facilities: Flow through the outlet is controlled by 8-inch gate valve

HYDROMETEOROLOGICAL GAGES: (None)

a. Type: _____

b. Location: _____

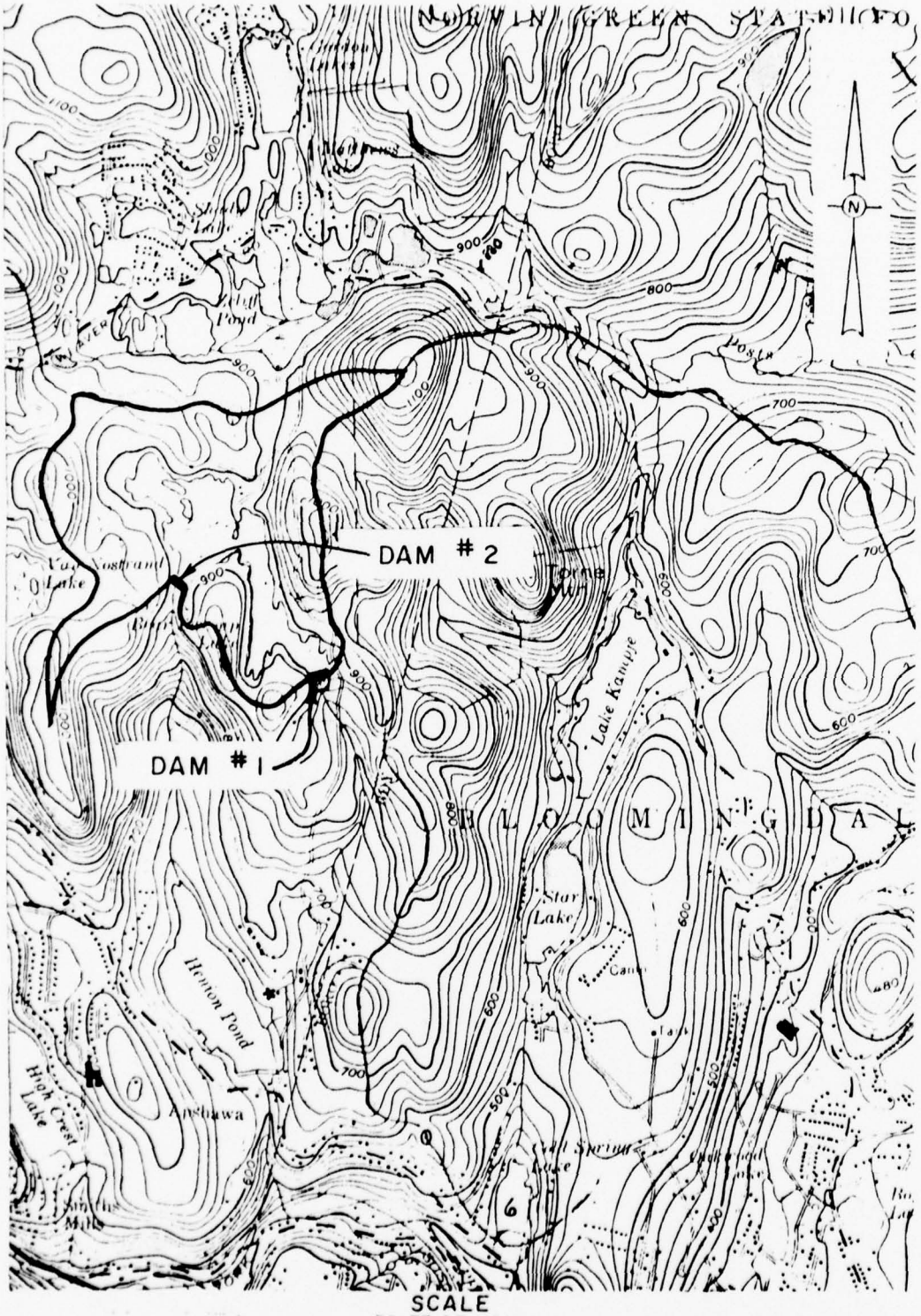
c. Records: _____

MAXIMUM NON-DAMAGING DISCHARGE: Not applicable

APPENDIX D

HYDROLOGIC COMPUTATIONS

PLATE I APPENDIX D



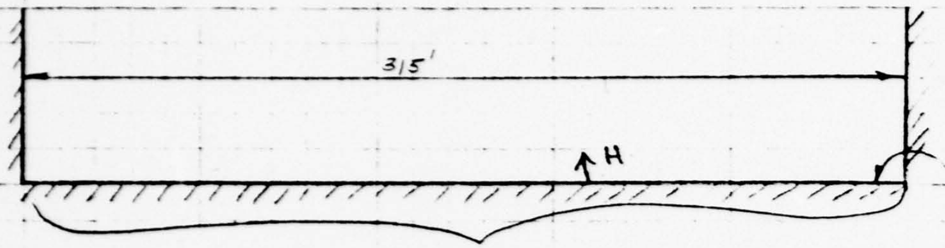
BEAR SWAMP LAKE DAMS #1 & #2
DRAINAGE MAP

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. ____ OF ____

BEAR SWAMP LAKE DAM I — JOB NO. 1212-001

OVERTOP RATING CURVE — BY ____ DATE ____

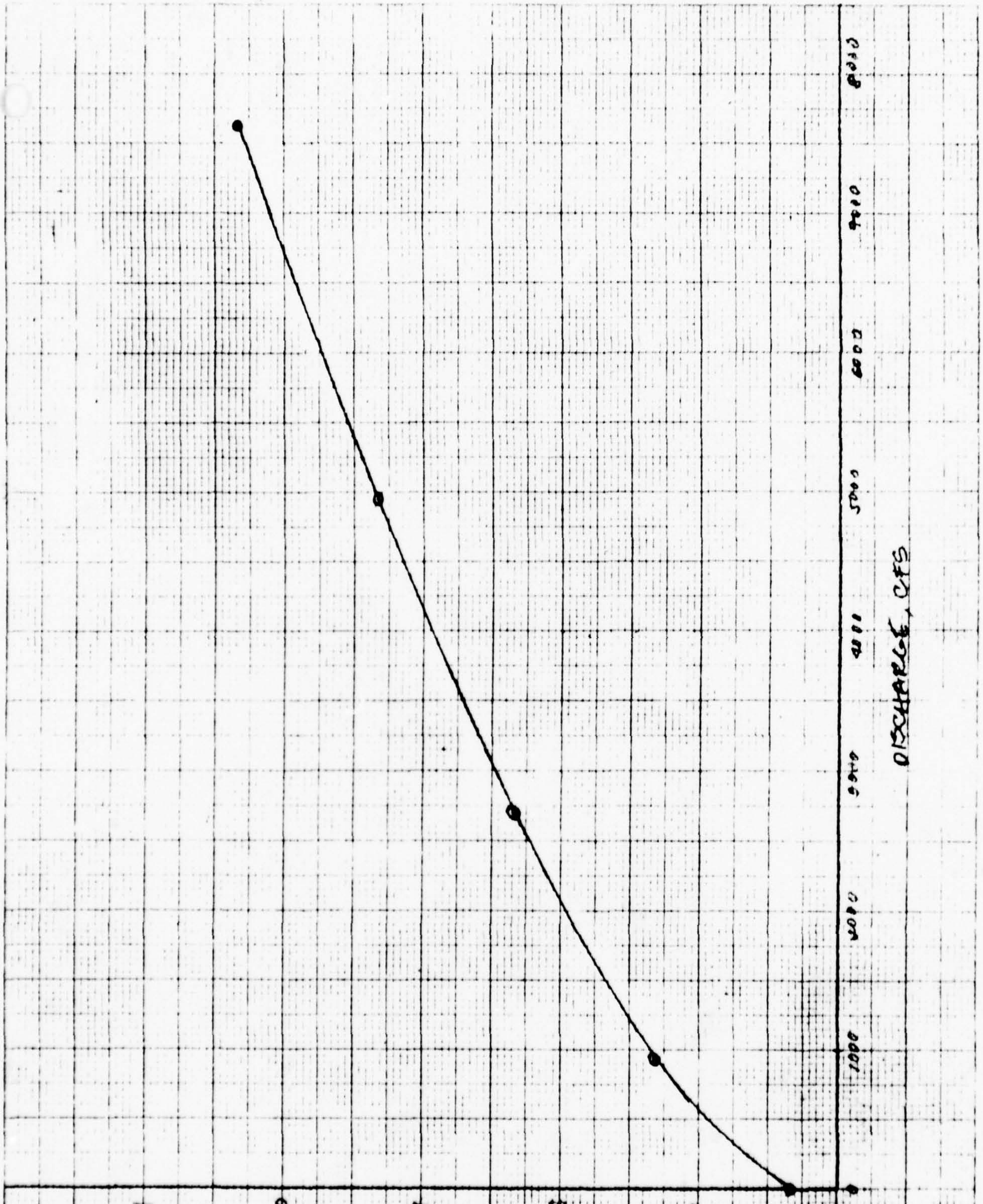


ASSUMED ELEVATION
= 886.33 Ft

ASSUME BROAD CRESTED WEIR
C = 3.03

ELEV. (MSL) (Assumed)	H ft	L ft	C	$Q = CLH^{1.5}$ cfs
886.33	0			0
887.33	1	315	3.03	954
888.33	2	315	3.03	2700
889.33	3	315	3.03	4959
890.33	4	315	3.03	7636

PLATE 2, APPENDIX D



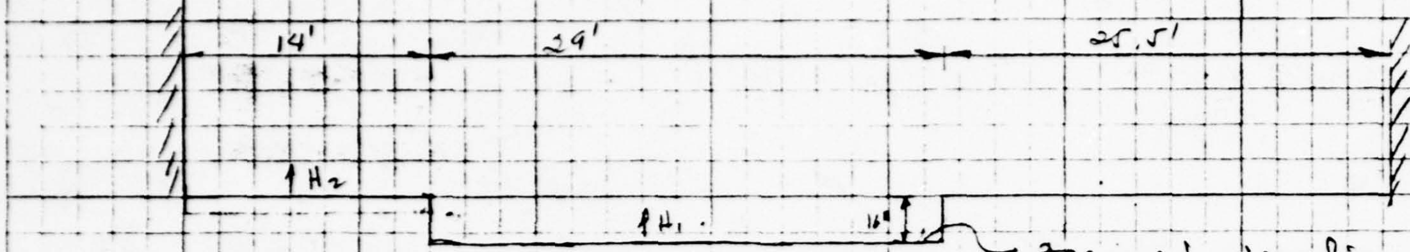
BEAR SWAMP LAKE DAM 1
OVERTOP DISCHARGE RATING CURVE

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 1 OF

BEAR SWAMP LAKE DAM #2 — JOB NO. 1212-002.

SPILLWAY & OVERTOP RATING CURVE — BY MAS — DATE 7-18-78



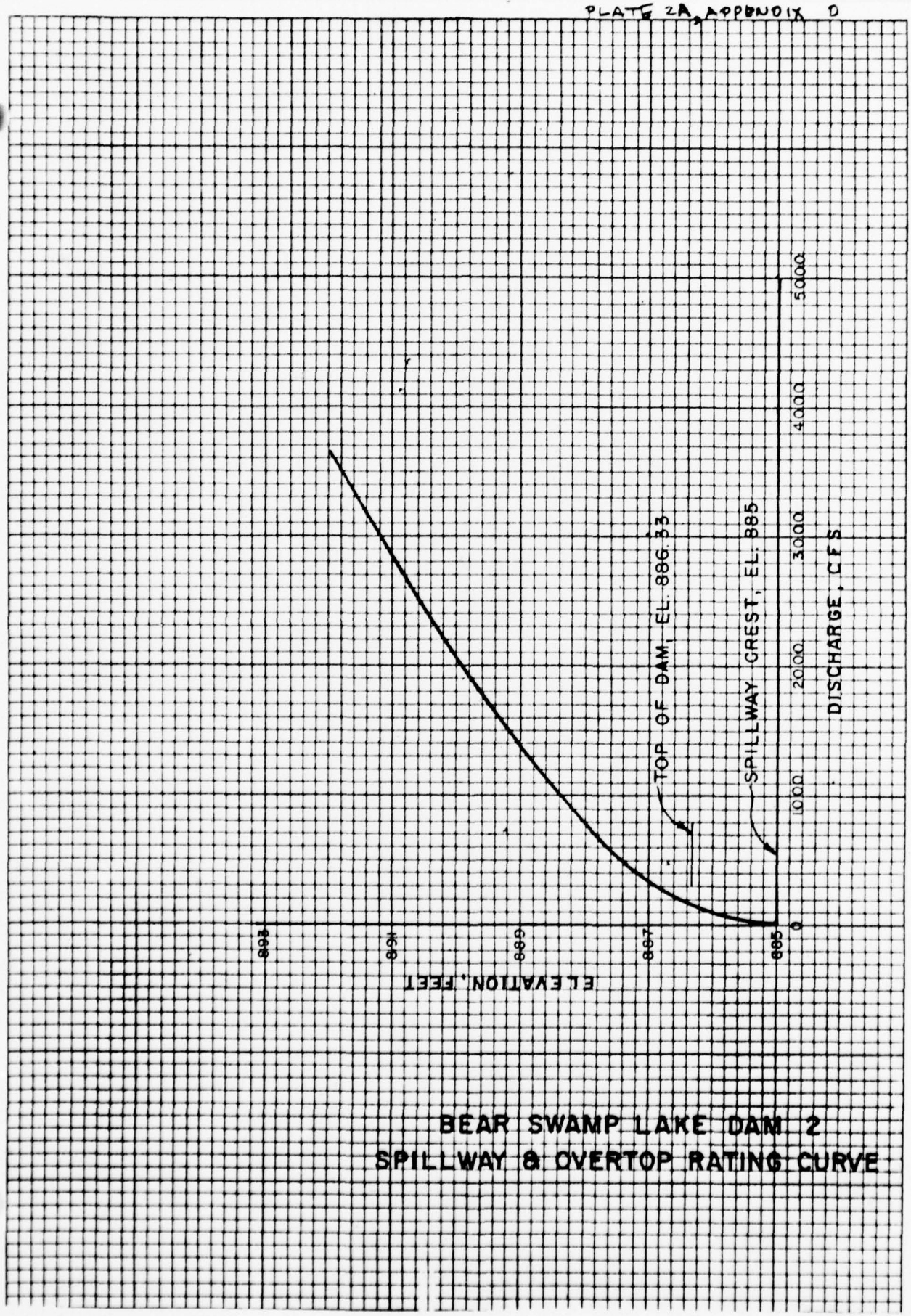
Assumed elevation = 885

$L_1 = 29'$, $L_2 = 14 + 25.5 = 39.5'$

ELEV. (MSL) Assumed Feet	HEAD on Masonry Weir Crest, Ft.	H_1	H_2	L_1	L_2*	C_1	C_2	$Q = \sum_{i=1}^{2} C_i L_i H_i^{1.5}$
885?	0	0	0					0
886	1	1	0	29		3.2		93
886.33	1.33	1.33	0	29		3.2		142
887	2	2	.67	29	39.5	3.4	3.03	345
888	3	3	1.67	29	39.5	3.6	3.03	800
889	4	4	2.67	29	39.5	3.7	3.03	1380
890	5	5	3.67	29	39.5	3.8	3.03	2073
891	6	6	4.67	29	39.5	3.8	3.03	2828
892	7	7	5.67	29	39.5	3.8	3.03	3657

* The saddles were not taken into consideration

PLATE 2A, APPENDIX D



BEAR SWAMP LAKE DAM 2
SPILLWAY & OVERTOP RATING CURVE

ECI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 1 OF
BEAR SWAMP LAKE #1, #2 — JOB NO. 12/2-001-1
COMBINED SPILLWAY & OVERTOP RATING CURVE — BY JMAB DATE 8/8/

BEAR SWAMP LAKE DAM #1&2

COMBINED SPILLWAY & OVERTOP RATING CURVE

Assumed ELEV (FT)	DAM #1 DISCHARGE (CFS)	DAM #2 DISCHARGE (CFS)	TOTAL DISCHARGE (CFS)
885.00 (SPILLWAY CREST) of Dam #2	0.0	0.0	0.0
885.50	0.0	40.0	40.0
886.00	0.0	90.0	90.0
886.25	0.0	135.0	135.0
886.33 (TOP OF DAM)	0.0	150.0	150.0
886.50	20.0	190.0	210.0
887.00	560.0	350.0	910.0
888.00	2075.0	800.0	2875.0
889.00	4150.0	1400.0	5550.0
890.00	6720.0	2080.0	8800.0

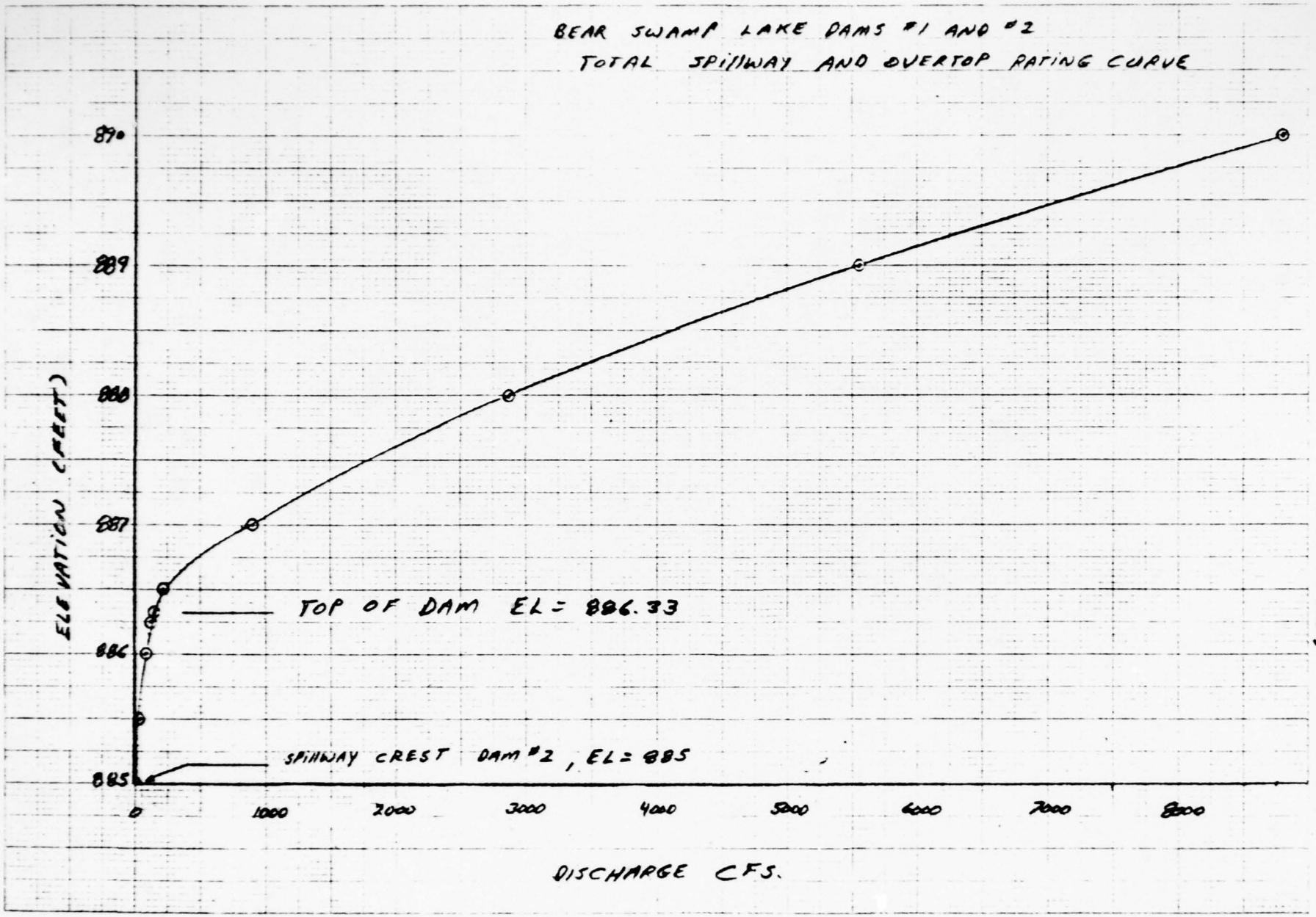


PLATE 2B, APPENDIX D

I-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 1 OF
BEAR SWAMP LAKE DAM # 1&2 — JOB NO. 1212-001
RESERVOIR AREA CAPACITY DATA — BY MAB DATE 7-27-78

BEAR SWAMP LAKE DAM # 1&2

RESERVOIR AREA CAPACITY DATA

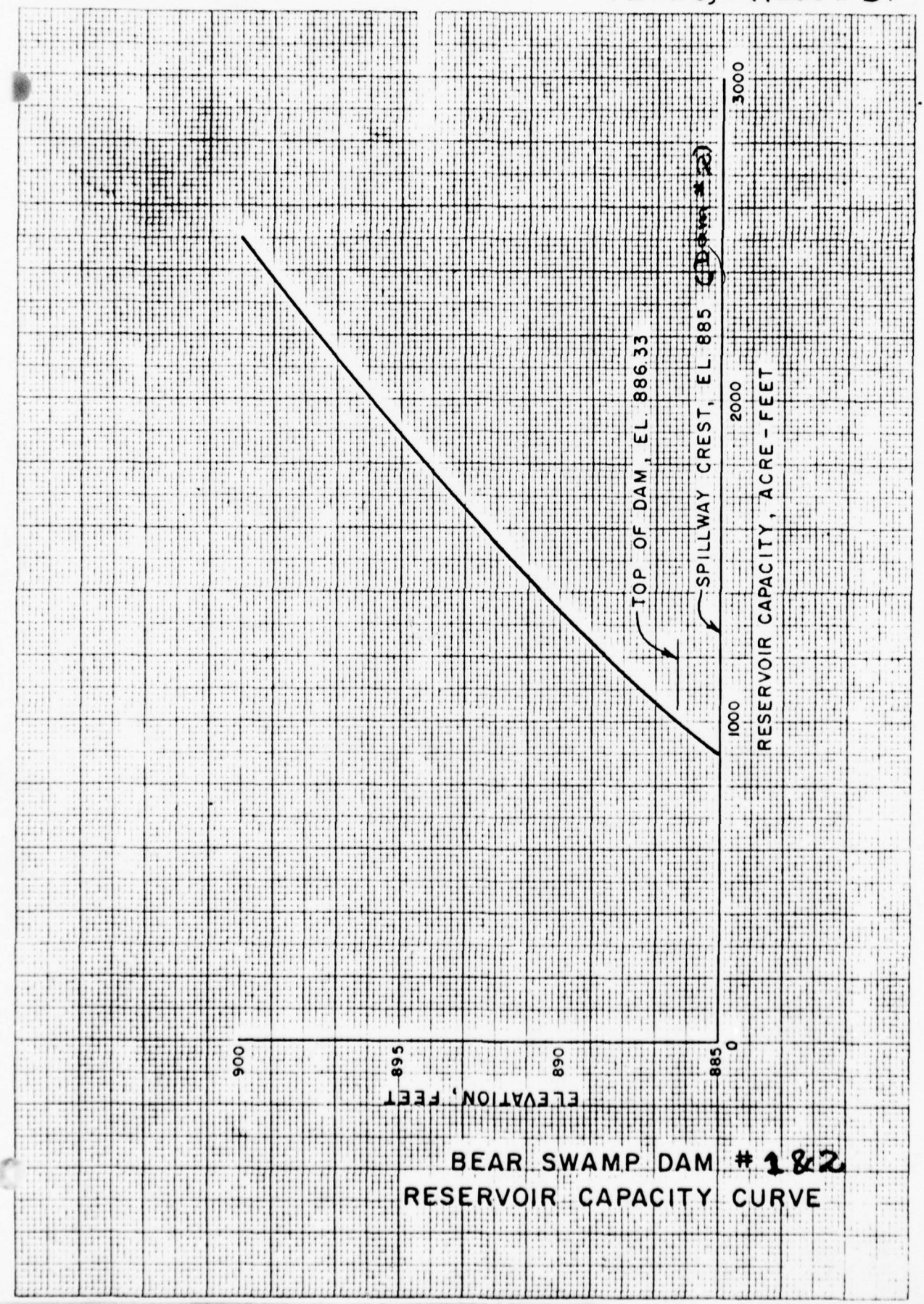
MAX STORAGE = 1000 AC FT
NORMAL STORAGE = 900 AC FT
} From Dam Inventory Table of Bear Swamp Lake Dam 2

RESERVOIR SURFACE AREA = 64 Acres

AT AN ASSUMED ELEVATION OF = 885 FT

ELEVATION (MSL) FT	RESERVOIR AREA ACRES	RESERVOIR VOLUME AC-FT	REMARKS
885	64	900	Normal Vol. of 900 AF is assumed to be at Spillway crest of Bear Swamp Lake Dam #2.
886.33	86.4	1000	Maximum Volume of 1000 AF is assumed to be at top of dams 1 & 2. Worked backward to obtain the area.
892.5	109	1603	
900	128	2492.	

PLATE 3, APPENDIX D.



BEAR SWAMP DAM #1&2
RESERVOIR CAPACITY CURVE

ECI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 1 OF
BEAR SWAMP LAKE DAM #1 + 2 — JOB NO. 1212-001
UNIT HYDROGRAPH — BY EBJ DATE 7-X-

UNIT HYDROGRAPH - BEAR SWAMP LAKE DAM #1 +2

a) DRAINAGE AREA; A = 0.14 sq. mi.

b) L = 0.246 mi. (from page 2)

c) $T_c = \left(\frac{11.9L^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times 0.246^3}{52}\right)^{.385} = 0.11$ hrs.

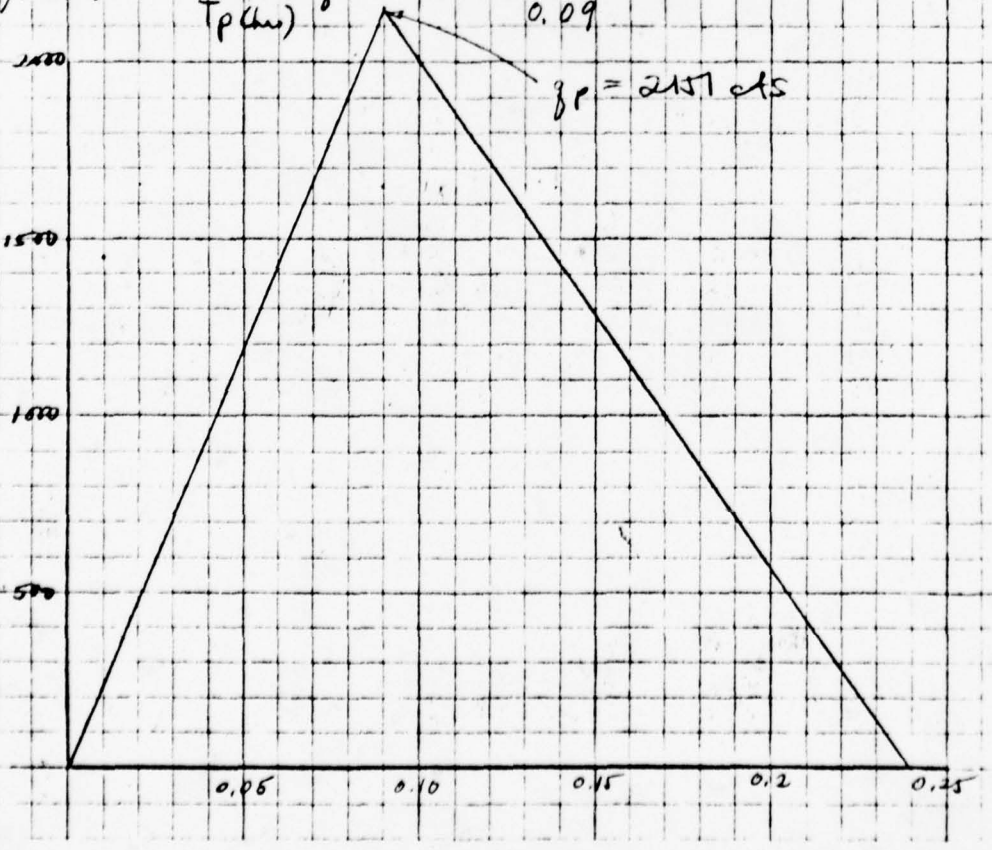
D) Assume $D \simeq \frac{1}{2} T_c = .05$ hrs.

E) $T_p = \frac{D}{2} + 0.6 T_c$

$= \frac{0.05}{2} + 0.6(.11) = 0.09$ hrs.

F) $T_b = 2.67 T_p = 2.67(.09) = .24$ hrs.

G) $q_{p\,(calc)} = \frac{484 A(sq\,mi)}{T_p(hrs)} = \frac{484(0.14)}{0.09} = 215$ cfs



CI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY (STATE) DAM SAFET. INSPECTION — SHEET NO. 2 OF
BEAR SWAMP LAKE DAM #1+2 — JOB NO. 1212-001
UNIT HYDROGRAPH — BY GBJ DATE 9-25-

$\Delta H_{AB} = 950 - 885 = 65'$

$\Delta H_{CD} = 910 - 885 = 25'$

$\Delta H_{EF} = 950 - 885 = 65'$

$L_{AB} = .67'' \times \frac{24000}{12 \times 5280} = .254$ mi.

$L_{CD} = .60'' \times \frac{24000}{12 \times 5280} = .227$ mi.

$L_{EF} = .68'' \times \frac{24000}{12 \times 5280} = .258$ mi.

$\Delta H_{ave} = \frac{65 + 65 + 25}{3} = 52'$

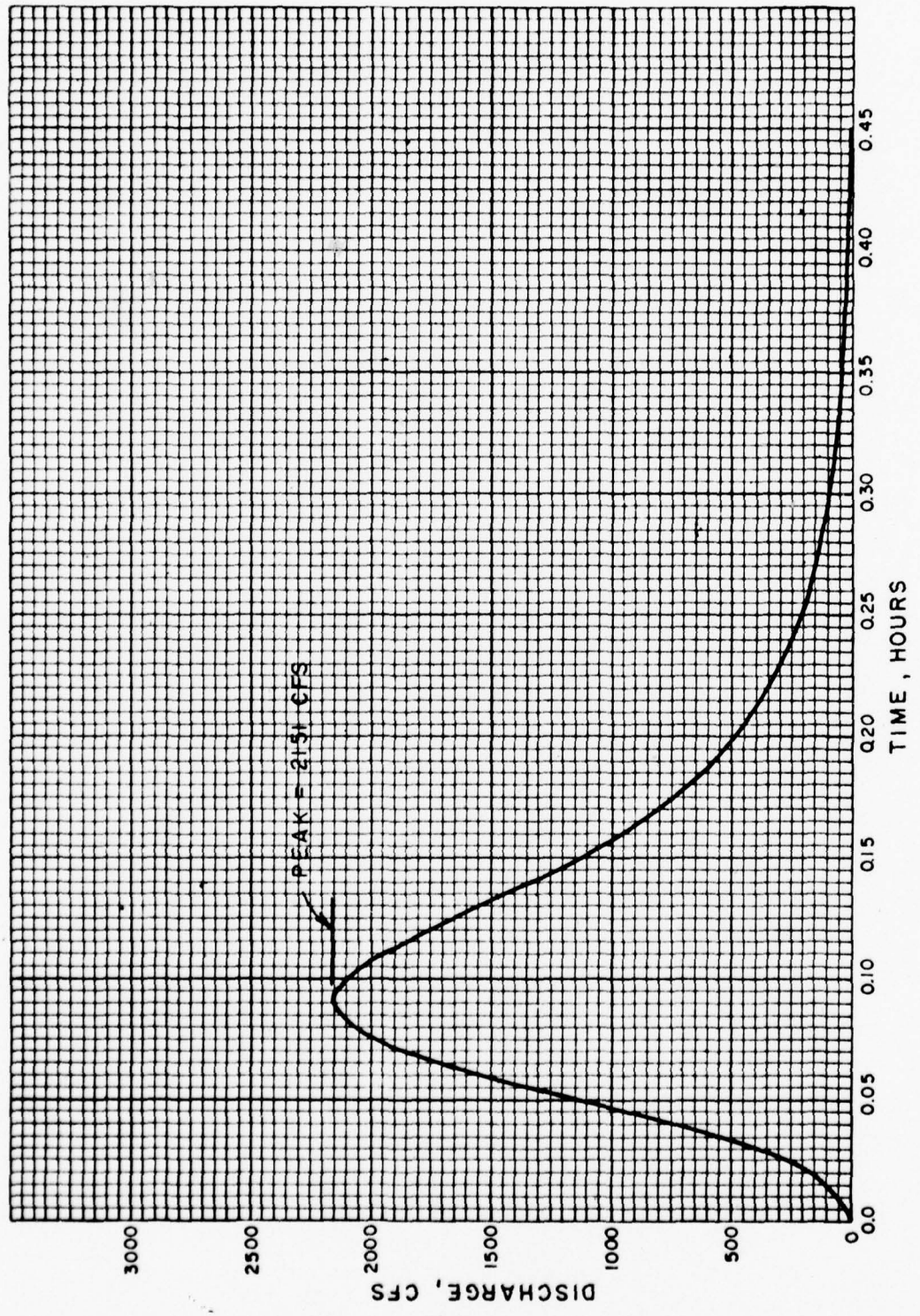
$L_{ave} = \frac{.254 + .227 + .258}{3} = .246$ mi.

ECI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY (STATE) DAM SAFETY INSPECTION — SHEET NO. 4 OF
BEAR SWAMP LAKE DAM #1 + 2 — JOB NO. 1212-001
UNIT HYDROGRAPH — BY GBJ DATE 9-25

H) DRAW A CURVILINEAR UNIT HYDROGRAPH

TIME RATIO T/T_p	DISCHARGE RATIO q/q_p	UNIT GRAPH TIME, T hrs.	UNIT GRAPH DISCHARGE, q cfs
0	0	0	0
0.1	0.015	0.009	32
0.2	0.075	0.018	161
0.3	0.16	0.027	344
0.4	0.28	0.036	602
0.5	0.43	0.045	925
0.6	0.60	0.054	1291
0.7	0.77	0.063	1656
0.8	0.89	0.072	1914
0.9	0.97	0.081	2086
1.0	1.00	0.090	2151
1.1	0.98	0.099	2108
1.2	0.92	0.108	1979
1.3	0.84	0.117	1807
1.4	0.75	0.126	1613
1.5	0.66	0.135	1420
1.6	0.56	0.144	1205
1.8	0.42	0.162	903
2.0	0.32	0.180	688
2.2	0.24	0.198	516
2.4	0.18	0.216	387
2.6	0.13	0.234	280
2.8	0.098	0.252	211
3.0	0.075	0.270	161
3.5	0.036	0.315	77
4.0	0.018	0.360	39
4.5	0.009	0.405	19
5.0	0.004	0.450	9



BEAR SWAMP LAKE DAM NO. 1&2
0.05 HOUR UNIT HYDROGRAPH

PMF DERIVATION ... SHEET NO. ___ OF ___
JOB NO. ___
Probable Maximum Precipitation BY YIN DATE ___ 197_

PROBABLE MAXIMUM FLOOD CALCULATION (PMF)

DRAINAGE = 0.40 sq. mi.

From Hydrometeorological Report #33 "Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Duration of 6, 12, 24 and 48 Hours" 1956

For D.A. = 10 sq. mi.
6 Hour rainfall duration
PMP = 25.0" for Zone-6 at this Basin.

Since D.A. < 10 sq. mi., No area reduction to be applied
PMP Values for varies rainfall duration

Duration	PMP (inch)	
6 Hr	1 ×	25.0"
12 Hr	1.09 ×	27.25
24 Hr	1.17 ×	29.25
48 Hr	1.26 ×	31.50

PMP Values are reduced by 20% to account for misalignment of Basin and Storms' Isohyetals

Duration	PMP
6 Hr	20"
12 Hr	21.8
24 Hr	23.4
48 Hr	25.2"

∴ Can be neglected.

ECI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY DAM SAFETY INSPECTION (DEP) SHEET NO. ____ OF ____
PMF DERIVATION — BEAR SWAMP LAKE DAM #182 JOB NO. 1212 001-1
PROBABLE MAXIMUM PRECIPITATION BY KLB DATE 2-22-

PMP - PMF DERIVATION

1) SOIL GROUP "C" & AMC II

2) CN = 85

MIN LOSS RATE FOR ABOVE CONDITION IS 0.12"/HR

OR 0.006"/.05 HR

FOR CN = 85

S = 1.76 IN THE EQ.

$$Q = (P - 0.75)^2 / P + 0.85$$

OR $$Q = (P - 0.352)^2 / (P + 1.408)$$

ECI-4 **ENGINEERING CONSULTANTS, INC.**

NEW JERSEY DAM SAFETY INSPECTION (DEP) SHEET NO. 1 OF ____

PMF DERIVATION - BEAR SWAMP LAKE DAM #2 JOB NO. 1212-001-1

DIRECT RUNOFF BY KLB DATE 7-27-7

DIRECT RUNOFF FOR COMPUTING PMF.

TIME ENDING (HR)	INCREMENTAL DESIGN RAINFALL (IN)	ACCUMULATIVE DESIGN RAINFALL (IN)	DIRECT RUNOFF ACCUMULATIVE	DIRECT RUNOFF INCREMENTAL	INCREMENTAL LOSS (IN)
0.05	.10	.10	0	0	0.100
0.10	.10	.20	0	0	0.100
0.15	.10	.30	0	0	0.100
0.20	.10	.40	.001	.001	0.090
0.25	.10	.50	.011	.010	0.090
0.30	.10	.60	.031	.020	0.080
0.35	.10	.70	.057	.026	0.074
0.40	.10	.80	.091	.034	0.066
0.45	.10	.90	.130	.039	0.061
0.50	.10	1.00	.174	.040	0.060
0.55	.10	1.10	.223	.049	0.051
0.60	.10	1.20	.276	.053	0.047
0.65	.10	1.30	.332	.056	0.044
0.70	.10	1.40	.391	.059	0.041
0.75	.10	1.50	.453	.062	0.038
0.80	.10	1.60	.518	.065	0.035
0.85	.10	1.70	.585	.067	0.033
0.90	.10	1.80	.654	.069	0.031
0.95	.10	1.90	.724	.070	0.030
1.00	.10	2.00	.797	.073	0.027
1.05	.12	2.12	.886	.089	0.031
1.10	.12	2.24	.977	.091	0.029
1.15	.12	2.36	1.070	.093	0.027
1.20	.12	2.48	1.165	.095	0.025
1.25	.12	2.60	1.261	.096	0.024
1.30	.12	2.72	1.358	.097	0.023
1.35	.12	2.84	1.457	.099	0.021
1.40	.12	2.96	1.557	.100	0.020
1.45	.12	3.08	1.658	.101	0.019
1.50	.12	3.20	1.760	.102	0.018

ECI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY DAM SAFETY INSPECTION (DEP) SHEET NO. 2 OF
PMF DERIVATION - BEAR SWAMP LAKE DAM #122 JOB NO. 212-001-1.
DIRECT RUNOFF BY HLB DATE 7-22-82

DIRECT RUNOFF FOR COMPUTING PMF

	TIME ENDING (HR)	INCREMENTAL DESIGN RAINFALL (IN)	ACCUMULATIVE DESIGN RAINFALL (IN)	DIRECT RUNOFF ACCUMULATIVE	DIRECT RUNOFF INCREMENTAL	INCREMENTAL LOSS (IN)
	1.55	.12	3.32	1.863	.103	0.017
	1.60	.12	3.44	1.967	.104	0.016
	1.65	.12	3.56	2.072	.105	0.015
	1.70	.12	3.68	2.177	.105	0.015
	1.75	.12	3.80	2.283	.106	0.014
	1.80	.12	3.92	2.389	.106	0.014
	1.85	.12	4.04	2.497	.107	0.013
	1.90	.12	4.16	2.604	.107	0.013
	1.95	.12	4.28	2.713	.109	0.011
2.4	2.00	.12	4.40	2.821	.108	0.012
	2.05	.15	4.55	2.958	.137	0.013
	2.10	.15	4.70	3.095	.137	0.013
	2.15	.15	4.85	3.233	.138	0.012
	2.20	.15	5.00	3.371	.138	0.012
	2.25	.15	5.15	3.510	.139	0.011
	2.30	.15	5.30	3.650	.140	0.010
	2.35	.15	5.45	3.790	.140	0.010
	2.40	.15	5.60	3.930	.140	0.010
	2.45	.15	5.75	4.071	.141	0.009
	2.50	.15	5.90	4.212	.141	0.009
	2.55	.15	6.05	4.353	.141	0.009
	2.60	.15	6.20	4.495	.142	0.008
	2.65	.15	6.35	4.637	.142	0.008
	2.70	.15	6.50	4.780	.143	0.007
	2.75	.15	6.65	4.922	.142	0.008
	2.80	.15	6.80	5.065	.143	0.007
	2.85	.15	6.95	5.209	.144	0.006
	2.90	.15	7.10	5.352	.144	0.006
	2.95	.15	7.25	5.496	.144	0.006
3.0	3.00	.15	7.40	5.640	.144	0.006

ECI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY DAM SAFETY INSPECTION - (DIF) SHEET NO. 3 OF
PMF DERIVATION - BEAR SWAMP LAKE DAM # 122 JOB NO. 1215 001-1
DIRECT RUNOFF BY HLB DATE 7-27-

DIRECT RUNOFF FOR COMPUTING PMF,

	TIME ENDING (HR)	INCREMENTAL DESIGN RAINFALL (IN)	ACCUMULATIVE DESIGN RAINFALL (IN)	DIRECT RUNOFF ACCUMULATIVE	DIRECT RUNOFF INCREMENTAL	INITIAL LOSS (IN)
	3.05	0.37	7.77	5.996	0.364	0.006
	3.10	0.37	8.14	6.352	0.364	0.006
	3.15	0.37	8.51	6.710	0.364	0.006
	3.20	0.37	8.88	7.069	0.364	0.006
	3.25	0.37	9.25	7.429	0.364	0.006
	3.30	0.37	9.62	7.789	0.364	0.006
	3.35	0.37	9.99	8.150	0.364	0.006
	3.40	0.37	10.36	8.511	0.364	0.006
	3.45	0.37	10.73	8.873	0.364	0.006
	3.50	0.37	11.10	9.736	0.364	0.006
(7.5%)	3.55	0.57	11.67	9.795	0.564	0.006
	3.60	0.37	12.04	10.158	0.364	0.006
	3.65	0.37	12.41	10.522	0.364	0.006
	3.70	0.37	12.78	10.886	0.364	0.006
	3.75	0.37	13.15	11.251	0.364	0.006
	3.80	0.37	13.52	11.616	0.364	0.006
	3.85	0.37	13.89	11.980	0.364	0.006
	3.90	0.37	14.26	12.346	0.364	0.006
	3.95	0.37	14.63	12.711	0.364	0.006
7.6	4.00	0.37	15.00	13.077	0.364	0.006
	4.05	0.14	15.14	13.215	0.134	0.006
	4.10	0.14	15.28	13.354	0.134	0.006
	4.15	0.14	15.42	13.492	0.134	0.006
	4.20	0.14	15.56	13.631	0.134	0.006
	4.25	0.14	15.70	13.769	0.134	0.006
	4.30	0.14	15.84	13.908	0.134	0.006
	4.35	0.14	15.98	14.046	0.134	0.006
	4.40	0.14	16.12	14.185	0.134	0.006
	4.45	0.14	16.26	14.323	0.134	0.006
	4.50	0.14	16.40	14.462	0.134	0.006

ECI-4 ENGINEERING CONSULTANTS, INC.

NEW JERSEY DAM SAFETY INSPECTION — SHEET NO. 4 OF
PMF DERIVATION - BEAR SWAMP LAKE DAM #187 — JOB NO. 1212-001-1
DIRECT RUNOFF — BY K/B DATE 7-27-

DIRECT RUNOFF FOR COMPUTING PMF

	TIME ENDING (HR)	INCREMENTAL DESIGN RAINFALL (IN)	ACCUMULATIVE DESIGN RAINFALL (IN)	DIRECT RUNOFF ACCUMULATIVE	DIRECT RUNOFF INCREMENTAL	INCREMENTAL LOSS (IN)
	4.55	.14	16.54	14.601	0.134	0.006
	4.60	.14	16.68	14.739	0.134	0.006
	4.65	.14	16.82	14.878	0.134	0.006
	4.70	.14	16.96	15.017	0.134	0.006
	4.75	.14	17.10	15.155	0.134	0.006
	4.80	.14	17.24	15.294	0.134	0.006
	4.85	.14	17.38	15.433	0.134	0.006
	4.90	.14	17.52	15.572	0.134	0.006
	4.95	.14	17.66	15.710	0.134	0.006
28	5.00	.14	17.80	15.849	0.134	0.006
	5.05	.11	17.91	15.958	0.104	0.006
	5.10	.11	18.02	16.067	0.104	0.006
	5.15	.11	18.13	16.177	0.104	0.006
	5.20	.11	18.24	16.286	0.104	0.006
	5.25	.11	18.35	16.395	0.104	0.006
	5.30	.11	18.46	16.504	0.104	0.006
	5.35	.11	18.57	16.613	0.104	0.006
	5.40	.11	18.68	16.722	0.104	0.006
	5.45	.11	18.79	16.831	0.104	0.006
	5.50	.11	18.90	16.941	0.104	0.006
	5.55	.11	19.01	17.050	0.104	0.006
	5.60	.11	19.12	17.159	0.104	0.006
	5.65	.11	19.23	17.268	0.104	0.006
	5.70	.11	19.34	17.377	0.104	0.006
	5.75	.11	19.45	17.487	0.104	0.006
	5.80	.11	19.56	17.596	0.104	0.006
	5.85	.11	19.67	17.705	0.104	0.006
	5.90	.11	19.78	17.814	0.104	0.006
	5.95	.11	19.89	17.923	0.104	0.006
29	6.00	.11	20.00	18.033	0.104	0.006

* MINIMUM LOSS RATE = .15" /HR = .006" /.05 HR
(AFTER THIS RATE IS REACHED

ENGINEERING CONSULTANTS, INC.

NEW JERSEY (STATE) DAM SAFETY INSPECTION
BEAR SWAMP LAKE DAMS #1, #2
INPUT TO HEC-1 (REVISED)

SHEET NO. 1 OF
JOB NO. 1212-001-1
BY KLB DATE 8-8-

INPUT TO HEC-1

*	ELEV (FT)	HEAD ABOVE SPILLWAY (FT)	Y2 STORAGE (AC-FT)	DAM #1 DISCHARGE (CFS)	DAM #2 DISCHARGE (CFS)	Y3 TOTAL DISCHARGE (CFS)
1	885.00 (SPILLWAY CREST)	0.0	900	0.0	0.0	0.0
2	885.50	0.5	940	0.00	40.0	40.0
3	886.00	1.0	980	0.00	90.0	90.0
4	886.75	1.25	998	0.00	135.0	135.0
5	886.33 (TOP OF DAM)	1.33	1000	0.00	150.0	150.0
6	886.50	1.50	1018	2000	190.0	210.0
7	887.00	2.00	1060	560.0	350.0	910.0
8	888.00	3.00	1150	2075.0	800.0	2875.0
9	889.00	4.00	1245	4150.0	1400.0	5550
10	890.00	5.00	1350	6720	2080.0	8800.

****
HEC-1 VERSION DATED JAN 1973

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DAM SAFETY INSPECTION - NEW JERSEY STATE
BEAR SWAMP LAKE DAMS 1 AND 2
PMF FLOOD ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	3	0	0	0	0	0	0	0

JOPER	NWT
5	0

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SUB-AREA RUNOFF COMPUTATION

INPUT UNIT HYDROGRAPH DERIVED FROM SCS METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	0.40	0.00	0.40	0.00	0.000	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
120	0.00	0.00	0.00

PRECIP PATTERN

0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.04
0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.07
0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14
0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
0.56	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

GIVEN UNIT GRAPH, NUHGQ= 10

0.	1250.	2151.	1080.	475.	220.	105.	45.	25.	5.

UNIT GRAPH TOTALS 5356. CFS OR 1.03 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

TIME	END-OF-PERIOD FLOW RAIN	EXCS	COMP Q
1	0.00	0.00	0.
2	0.00	0.00	0.
3	0.00	0.00	0.
4	0.00	0.00	0.
5	0.01	0.01	1.
6	0.02	0.02	14.
7	0.02	0.02	47.
8	0.03	0.03	86.
9	0.03	0.03	124.
10	0.04	0.04	161.
11	0.04	0.04	188.
12	0.05	0.05	213.
13	0.05	0.05	244.
14	0.05	0.05	269.
15	0.06	0.06	289.
16	0.06	0.06	307.
17	0.06	0.06	324.
18	0.06	0.06	339.
19	0.07	0.07	352.
20	0.07	0.07	363.
21	0.08	0.08	373.
22	0.09	0.09	402.
23	0.09	0.09	444.
24	0.09	0.09	470.
25	0.09	0.09	487.
26	0.09	0.09	500.
27	0.09	0.09	509.
28	0.10	0.10	517.
29	0.10	0.10	525.
30	0.10	0.10	532.
31	0.10	0.10	538.
32	0.10	0.10	543.
33	0.10	0.10	549.
34	0.10	0.10	554.
35	0.10	0.10	558.
36	0.10	0.10	562.
37	0.10	0.10	565.
38	0.10	0.10	567.
39	0.10	0.10	570.
40	0.10	0.10	574.
41	0.13	0.13	578.
42	0.13	0.13	614.
43	0.13	0.13	677.
44	0.13	0.13	709.
45	0.13	0.13	725.
46	0.14	0.14	734.
47	0.14	0.14	741.
48	0.14	0.14	745.
49	0.14	0.14	748.
50	0.14	0.14	750.

51	0.14	0.14	752.
52	0.14	0.14	754.
53	0.14	0.14	756.
54	0.14	0.14	758.
55	0.14	0.14	760.
56	0.14	0.14	762.
57	0.14	0.14	762.
58	0.14	0.14	765.
59	0.14	0.14	768.
60	0.14	0.14	770.
61	0.36	0.36	770.
62	0.36	0.36	1046.
63	0.36	0.36	1519.
64	0.36	0.36	1757.
65	0.36	0.36	1861.
66	0.36	0.36	1909.
67	0.36	0.36	1933.
68	0.36	0.36	1942.
69	0.36	0.36	1948.
70	0.36	0.36	1949.
71	0.56	0.56	1949.
72	0.36	0.36	2199.
73	0.36	0.36	2379.
74	0.36	0.36	2165.
75	0.36	0.36	2044.
76	0.36	0.36	1993.
77	0.36	0.36	1970.
78	0.36	0.36	1958.
79	0.36	0.36	1954.
80	0.36	0.36	1950.
81	0.13	0.13	1949.
82	0.13	0.13	1662.
83	0.13	0.13	1167.
84	0.13	0.13	918.
85	0.13	0.13	809.
86	0.13	0.13	759.
87	0.13	0.13	734.
88	0.13	0.13	724.
89	0.13	0.13	718.
90	0.13	0.13	717.
91	0.13	0.13	717.
92	0.13	0.13	717.
93	0.13	0.13	717.
94	0.13	0.13	717.
95	0.13	0.13	717.
96	0.13	0.13	717.
97	0.13	0.13	717.
98	0.13	0.13	717.
99	0.13	0.13	717.
100	0.13	0.13	717.
101	0.10	0.10	717.
102	0.10	0.10	680.
103	0.10	0.10	615.
104	0.10	0.10	583.
105	0.10	0.10	569.
106	0.10	0.10	562.

107	0.10	0.10	559.
108	0.10	0.10	557.
109	0.10	0.10	557.
110	0.10	0.10	557.
111	0.10	0.10	557.
112	0.10	0.10	557.
113	0.10	0.10	557.
114	0.10	0.10	557.
115	0.10	0.10	557.
116	0.10	0.10	557.
117	0.10	0.10	557.
118	0.10	0.10	557.
119	0.10	0.10	557.
120	0.10	0.10	557.
121	0.00	0.00	557.
122	0.00	0.00	427.
123	0.00	0.00	203.
124	0.00	0.00	90.
125	0.00	0.00	41.
126	0.00	0.00	18.
127	0.00	0.00	7.
128	0.00	0.00	3.
129	0.00	0.00	0.
130	0.00	0.00	0.
131	0.00	0.00	0.
132	0.00	0.00	0.
133	0.00	0.00	0.
134	0.00	0.00	0.
135	0.00	0.00	0.
136	0.00	0.00	0.
137	0.00	0.00	0.
138	0.00	0.00	0.
139	0.00	0.00	0.
140	0.00	0.00	0.
141	0.00	0.00	0.
142	0.00	0.00	0.
143	0.00	0.00	0.
144	0.00	0.00	0.
145	0.00	0.00	0.
146	0.00	0.00	0.
147	0.00	0.00	0.
148	0.00	0.00	0.
149	0.00	0.00	0.
150	0.00	0.00	0.
SUM	17.61	17.61	95755.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2379.	797.	638.	638.	95745.
INCHES		10.55	10.55	10.55	10.55
AC-FT		395.	395.	395.	395.

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THRU BEAR SWAMP DAMS 1 AND 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	20	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA
0	0	0	0.000	0.000	0.000	-1.

STORAGE=	900.	940.	980.	998.	1000.	1018.	1060.	1150.	1245.	1350.
OUTFLOW=	0.	40.	90.	135.	150.	210.	910.	2875.	5550.	8800.

TIME	EOP STOR	AVG IN	EOP OUT
1	900.	0.	0.
2	900.	0.	0.
3	900.	0.	0.
4	900.	0.	0.
5	900.	0.	0.
6	900.	7.	0.
7	900.	31.	0.
8	900.	67.	0.
9	900.	105.	0.
10	901.	143.	1.
11	902.	175.	2.
12	902.	201.	2.
13	903.	229.	3.
14	904.	257.	4.
15	906.	279.	6.
16	907.	298.	7.
17	908.	316.	8.
18	909.	332.	9.
19	911.	346.	11.
20	912.	357.	12.
21	914.	368.	14.
22	915.	388.	15.
23	917.	423.	17.
24	919.	457.	19.
25	921.	479.	21.
26	923.	494.	23.
27	925.	504.	25.
28	927.	513.	27.
29	929.	521.	29.
30	931.	529.	31.
31	933.	535.	33.
32	935.	541.	35.
33	937.	546.	37.
34	939.	552.	39.
35	941.	556.	42.
36	943.	560.	44.
37	945.	563.	47.
38	948.	566.	50.

39	950.	569.	52.
40	952.	572.	55.
41	954.	576.	58.
42	956.	596.	60.
43	959.	645.	63.
44	961.	693.	67.
45	964.	717.	70.
46	967.	729.	73.
47	969.	737.	77.
48	972.	743.	80.
49	975.	747.	84.
50	978.	749.	87.
51	980.	751.	92.
52	983.	753.	99.
53	986.	755.	105.
54	988.	757.	112.
55	991.	759.	119.
56	994.	761.	125.
57	996.	762.	132.
58	999.	764.	146.
59	1002.	767.	156.
60	1004.	769.	165.
61	1007.	770.	173.
62	1010.	908.	183.
63	1014.	1282.	198.
64	1020.	1638.	249.
65	1026.	1809.	353.
66	1032.	1885.	455.
67	1038.	1921.	553.
68	1044.	1938.	645.
69	1049.	1945.	732.
70	1054.	1949.	813.
71	1058.	1949.	888.
72	1063.	2074.	984.
73	1068.	2289.	1097.
74	1073.	2272.	1198.
75	1076.	2105.	1277.
76	1079.	2019.	1341.
77	1082.	1982.	1396.
78	1084.	1964.	1445.
79	1086.	1956.	1489.
80	1088.	1952.	1529.
81	1090.	1950.	1565.
82	1090.	1805.	1586.
83	1090.	1414.	1571.
84	1088.	1043.	1526.
85	1085.	864.	1469.
86	1082.	784.	1409.
87	1080.	747.	1352.
88	1077.	729.	1298.
89	1075.	721.	1249.
90	1073.	718.	1203.
91	1071.	717.	1161.
92	1069.	717.	1123.
93	1068.	717.	1088.
94	1066.	717.	1056.

95	1065.	717.	1026.
96	1064.	717.	1000.
97	1063.	717.	975.
98	1061.	717.	953.
99	1061.	717.	933.
100	1060.	717.	914.
101	1059.	717.	900.
102	1058.	698.	886.
103	1057.	647.	871.
104	1056.	599.	852.
105	1055.	576.	834.
106	1054.	565.	816.
107	1053.	560.	799.
108	1052.	558.	783.
109	1051.	557.	768.
110	1050.	557.	754.
111	1049.	557.	741.
112	1049.	557.	729.
113	1048.	557.	717.
114	1047.	557.	706.
115	1047.	557.	696.
116	1046.	557.	687.
117	1046.	557.	679.
118	1045.	557.	670.
119	1045.	557.	663.
120	1044.	557.	656.
121	1044.	557.	649.
122	1043.	492.	639.
123	1042.	315.	617.
124	1040.	147.	586.
125	1038.	66.	551.
126	1036.	30.	516.
127	1034.	13.	483.
128	1032.	5.	451.
129	1030.	1.	421.
130	1029.	0.	393.
131	1027.	0.	367.
132	1025.	0.	342.
133	1024.	0.	320.
134	1023.	0.	298.
135	1022.	0.	278.
136	1021.	0.	260.
137	1019.	0.	242.
138	1019.	0.	226.
139	1018.	0.	211.
140	1017.	0.	207.
141	1016.	0.	204.
142	1015.	0.	201.
143	1014.	0.	199.
144	1013.	0.	196.
145	1013.	0.	193.
146	1012.	0.	190.
147	1011.	0.	188.
148	1010.	0.	185.
149	1009.	0.	183.
150	1009.	0.	180.

SUM 69400.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1586.	575.	962.	962.	69400.
INCHES		13.39	13.44	13.44	13.44
AC-FT		285.	286.	286.	286.

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	2379.	797.	638.	638.	0.40
ROUTED TO	1	1586.	575.	462.	462.	0.40

****
HEC-1 VERSION DATED JAN 1973

****

DAM SAFETY INSPECTION - NEW JERSEY STATE
BEAR SWAMP LAKE DAMS 1 AND 2
ONE HALF OF PMF FLOOD ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	3	0	0	0	0	0	0	0

JOPER NWT
3 0

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SUB-AREA RUNOFF COMPUTATION

INPUT UNIT HYDROGRAPH DERIVED FROM SCS METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	0.40	0.00	0.40	0.00	0.500	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
120	0.00	0.00	0.00

PRECIP PATTERN

0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.04
0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.07
0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14
0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

GIVEN UNIT GRAPH, NUHGQ= 10

0. 1250. 2151. 1080. 475. 220. 105. 45. 25. 9.

UNIT GRAPH TOTALS 5356. CFS OR 1.03 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

TIME	END-OF-PERIOD FLOW RAIN	EXCS	COMP Q
1	0.00	0.00	0.
2	0.00	0.00	0.
3	0.00	0.00	0.
4	0.00	0.00	0.
5	0.01	0.01	1.
6	0.02	0.02	14.
7	0.02	0.02	47.
8	0.03	0.03	86.
9	0.03	0.03	124.
10	0.04	0.04	161.
11	0.04	0.04	188.
12	0.05	0.05	213.
13	0.05	0.05	244.
14	0.05	0.05	269.
15	0.06	0.06	289.
16	0.06	0.06	307.
17	0.06	0.06	324.
18	0.06	0.06	339.
19	0.07	0.07	352.
20	0.07	0.07	363.
21	0.08	0.08	373.
22	0.09	0.09	402.
23	0.09	0.09	444.
24	0.09	0.09	470.
25	0.09	0.09	487.
26	0.09	0.09	500.
27	0.09	0.09	509.
28	0.10	0.10	517.
29	0.10	0.10	525.
30	0.10	0.10	532.
31	0.10	0.10	538.
32	0.10	0.10	543.
33	0.10	0.10	549.
34	0.10	0.10	554.
35	0.10	0.10	558.
36	0.10	0.10	562.
37	0.10	0.10	565.
38	0.10	0.10	567.
39	0.10	0.10	570.
40	0.10	0.10	574.
41	0.13	0.13	578.
42	0.13	0.13	614.
43	0.13	0.13	677.
44	0.13	0.13	709.
45	0.13	0.13	725.
46	0.14	0.14	734.
47	0.14	0.14	741.
48	0.14	0.14	745.
49	0.14	0.14	748.
50	0.14	0.14	750.

51	0.14	0.14	752.
52	0.14	0.14	754.
53	0.14	0.14	756.
54	0.14	0.14	758.
55	0.14	0.14	760.
56	0.14	0.14	762.
57	0.14	0.14	762.
58	0.14	0.14	765.
59	0.14	0.14	768.
60	0.14	0.14	770.
61	0.36	0.36	770.
62	0.36	0.36	1046.
63	0.36	0.36	1519.
64	0.36	0.36	1757.
65	0.36	0.36	1861.
66	0.36	0.36	1909.
67	0.36	0.36	1933.
68	0.36	0.36	1942.
69	0.36	0.36	1948.
70	0.36	0.36	1949.
71	0.56	0.56	1949.
72	0.36	0.36	2199.
73	0.36	0.36	2379.
74	0.36	0.36	2165.
75	0.36	0.36	2044.
76	0.36	0.36	1993.
77	0.36	0.36	1970.
78	0.36	0.36	1958.
79	0.36	0.36	1954.
80	0.36	0.36	1950.
81	0.13	0.13	1949.
82	0.13	0.13	1662.
83	0.13	0.13	1167.
84	0.13	0.13	918.
85	0.13	0.13	809.
86	0.13	0.13	759.
87	0.13	0.13	734.
88	0.13	0.13	724.
89	0.13	0.13	718.
90	0.13	0.13	717.
91	0.13	0.13	717.
92	0.13	0.13	717.
93	0.13	0.13	717.
94	0.13	0.13	717.
95	0.13	0.13	717.
96	0.13	0.13	717.
97	0.13	0.13	717.
98	0.13	0.13	717.
99	0.13	0.13	717.
100	0.13	0.13	717.
101	0.10	0.10	717.
102	0.10	0.10	680.
103	0.10	0.10	615.
104	0.10	0.10	583.
105	0.10	0.10	569.
106	0.10	0.10	562.

107	0.10	0.10	559.
108	0.10	0.10	557.
109	0.10	0.10	557.
110	0.10	0.10	557.
111	0.10	0.10	557.
112	0.10	0.10	557.
113	0.10	0.10	557.
114	0.10	0.10	557.
115	0.10	0.10	557.
116	0.10	0.10	557.
117	0.10	0.10	557.
118	0.10	0.10	557.
119	0.10	0.10	557.
120	0.10	0.10	557.
121	0.00	0.00	557.
122	0.00	0.00	427.
123	0.00	0.00	203.
124	0.00	0.00	90.
125	0.00	0.00	41.
126	0.00	0.00	18.
127	0.00	0.00	7.
128	0.00	0.00	3.
129	0.00	0.00	0.
130	0.00	0.00	0.
131	0.00	0.00	0.
132	0.00	0.00	0.
133	0.00	0.00	0.
134	0.00	0.00	0.
135	0.00	0.00	0.
136	0.00	0.00	0.
137	0.00	0.00	0.
138	0.00	0.00	0.
139	0.00	0.00	0.
140	0.00	0.00	0.
141	0.00	0.00	0.
142	0.00	0.00	0.
143	0.00	0.00	0.
144	0.00	0.00	0.
145	0.00	0.00	0.
146	0.00	0.00	0.
147	0.00	0.00	0.
148	0.00	0.00	0.
149	0.00	0.00	0.
150	0.00	0.00	0.
SUM	17.61	17.61	95755.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2379.	797.	638.	638.	95745.
INCHES		18.55	18.55	18.55	18.55
AC-FT		395.	395.	395.	395.

RUNOFF MULTIPLIED BY 0.50

0.	0.	0.	0.	0.	7.	23.	43.	62.	80.
94.	106.	122.	134.	144.	153.	162.	169.	176.	181.
186.	201.	222.	235.	243.	250.	254.	258.	262.	266.

269.	271.	274.	277.	279.	281.	282.	283.	285.	287.
289.	307.	338.	354.	362.	367.	370.	372.	374.	375.
376.	377.	378.	379.	380.	381.	381.	382.	384.	385.
385.	523.	759.	878.	930.	954.	966.	971.	974.	974.
974.	1099.	1189.	1082.	1022.	996.	985.	979.	977.	975.
974.	831.	583.	459.	404.	379.	367.	362.	359.	358.
358.	358.	358.	358.	358.	358.	358.	358.	358.	358.
358.	340.	307.	291.	284.	281.	279.	278.	278.	278.
278.	278.	278.	278.	278.	278.	278.	278.	278.	278.
278.	213.	101.	45.	20.	9.	3.	1.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1189.	398.	319.	319.	47872.
INCHES		9.27	9.27	9.27	9.27
AC-FT		197.	197.	197.	197.

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HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THRU BEAR SWAMP DAMS 1 AND 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	20	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	0

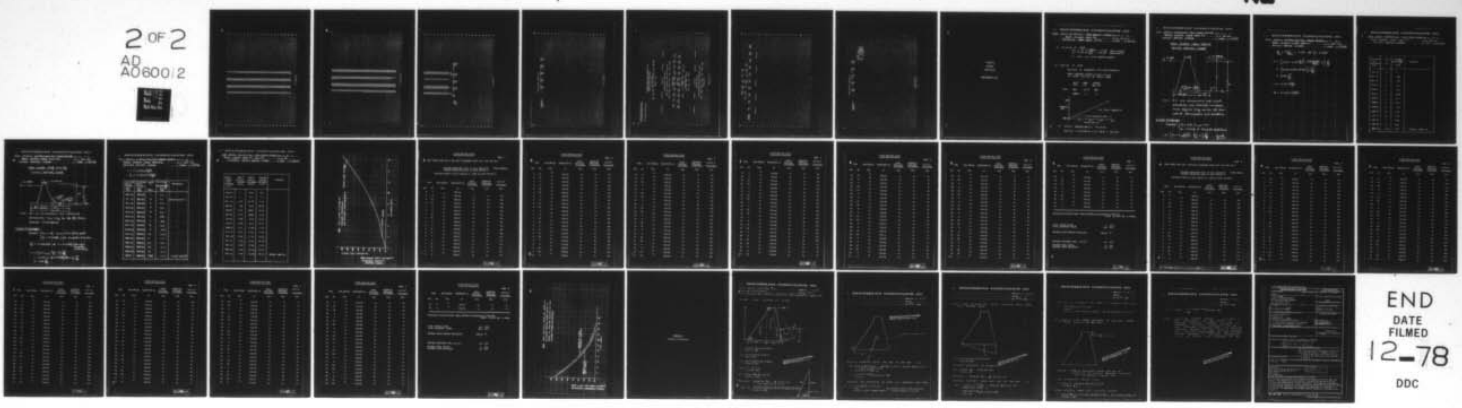
NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA
0	0	0	0.000	0.000	0.000	-1.

STORAGE=	900.	940.	980.	998.	1000.	1018.	1060.	1150.	1245.	1350.
OUTFLOW=	0.	40.	90.	135.	150.	210.	910.	2875.	5550.	8800.

TIME	EOP STOR	AVG IN	EOP OUT
1	900.	0.	0.
2	900.	0.	0.
3	900.	0.	0.
4	900.	0.	0.
5	900.	0.	0.
6	900.	3.	0.
7	900.	15.	0.
8	900.	33.	0.
9	900.	52.	0.
10	900.	71.	0.
11	901.	87.	1.
12	901.	100.	1.
13	901.	114.	1.
14	902.	128.	2.
15	903.	139.	3.
16	903.	149.	3.

AD-A060 012 HARRIS ECI ASSOCIATES WOODBRIDGE NJ F/G 13/2
NATIONAL DAM SAFETY PROGRAM. BEAR SWAMP LAKE DAM NUMBER 1 (NJ00--ETC(U)
AUG 78 R GERSHOWITZ DACW61-78-C-0124
UNCLASSIFIED NL

2 OF 2
AD
A060012



END
DATE
FILMED
12-78
DDC

17	904.	158.	4.
18	904.	166.	4.
19	905.	173.	5.
20	906.	178.	6.
21	907.	184.	7.
22	907.	194.	7.
23	908.	211.	8.
24	909.	228.	9.
25	910.	239.	10.
26	911.	247.	11.
27	912.	252.	12.
28	913.	256.	13.
29	914.	260.	14.
30	915.	264.	15.
31	916.	267.	16.
32	917.	270.	17.
33	918.	273.	18.
34	919.	276.	19.
35	920.	278.	20.
36	921.	280.	21.
37	923.	281.	23.
38	924.	283.	24.
39	925.	284.	25.
40	926.	286.	26.
41	927.	288.	27.
42	928.	298.	28.
43	929.	322.	29.
44	930.	346.	30.
45	932.	358.	32.
46	933.	364.	33.
47	935.	368.	35.
48	936.	371.	36.
49	937.	373.	37.
50	939.	374.	39.
51	940.	375.	40.
52	941.	376.	42.
53	943.	377.	44.
54	944.	378.	45.
55	946.	379.	47.
56	947.	380.	49.
57	948.	381.	51.
58	950.	382.	52.
59	951.	383.	54.
60	952.	384.	56.
61	954.	385.	57.
62	955.	454.	59.
63	958.	601.	62.
64	961.	819.	66.
65	964.	904.	71.
66	968.	942.	75.
67	972.	960.	80.
68	975.	969.	84.
69	979.	972.	89.
70	983.	974.	97.
71	986.	974.	106.
72	990.	1037.	116.

73	994.	1144.	126.
74	998.	1136.	141.
75	1002.	1052.	158.
76	1006.	1009.	170.
77	1009.	991.	181.
78	1012.	982.	192.
79	1016.	978.	203.
80	1019.	976.	229.
81	1022.	975.	278.
82	1024.	902.	320.
83	1026.	707.	346.
84	1026.	521.	357.
85	1027.	432.	362.
86	1027.	392.	364.
87	1027.	373.	365.
88	1027.	364.	365.
89	1027.	360.	365.
90	1027.	359.	364.
91	1027.	358.	364.
92	1027.	358.	363.
93	1027.	358.	363.
94	1027.	358.	363.
95	1027.	358.	362.
96	1027.	358.	362.
97	1027.	358.	362.
98	1027.	358.	362.
99	1027.	358.	361.
100	1027.	358.	361.
101	1027.	358.	361.
102	1027.	349.	360.
103	1026.	323.	358.
104	1026.	299.	354.
105	1026.	288.	349.
106	1026.	282.	345.
107	1025.	280.	341.
108	1025.	279.	337.
109	1025.	278.	333.
110	1025.	278.	329.
111	1024.	278.	326.
112	1024.	278.	322.
113	1024.	278.	320.
114	1024.	278.	317.
115	1024.	278.	314.
116	1024.	278.	312.
117	1024.	278.	310.
118	1023.	278.	307.
119	1023.	278.	306.
120	1023.	278.	304.
121	1023.	278.	302.
122	1023.	246.	298.
123	1022.	197.	289.
124	1021.	73.	274.
125	1020.	33.	258.
126	1019.	15.	242.
127	1019.	6.	226.
128	1018.	2.	211.

129	1017.	0.	207.	
130	1016.	0.	204.	
131	1015.	0.	201.	
132	1014.	0.	199.	
133	1013.	0.	196.	
134	1013.	0.	193.	
135	1012.	0.	191.	
136	1011.	0.	188.	
137	1010.	0.	185.	
138	1009.	0.	183.	
139	1009.	0.	180.	
140	1008.	0.	178.	
141	1007.	0.	175.	
142	1007.	0.	173.	
143	1006.	0.	171.	
144	1005.	0.	168.	
145	1004.	0.	166.	
146	1004.	0.	164.	
147	1003.	0.	161.	
148	1002.	0.	159.	
149	1002.	0.	157.	
150	1001.	0.	155.	
SUM			23357.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	365.	193.	155.	155.	23357.
INCHES		4.49	4.52	4.52	4.52
AC-FT		95.	96.	96.	96.

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	1189.	398.	319.	819.	0.40
ROUTED TO	1	365.	193.	155.	155.	0.40

****
HEC-1 VERSION DATED JAN 1973

****

DAM SAFETY INSPECTION - NEW JERSEY STATE
BEAR SWAMP LAKE DAMS 1 AND 2
PERCENT OF PMF FLOOD ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	3	0	0	0	0	0	4	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT UNIT HYDROGRAPH DERIVED FROM SCS METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	0.40	0.00	0.40	0.00	0.340	0	0	0

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
SUM	17.61	17.61	95755.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THRU BEAR SWAMP DAMS 1 AND 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	0	0	1

ROUTING DATA

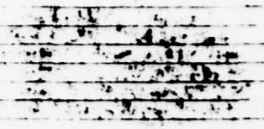
BLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
0	0	0	0.000	0.000	0.000	-1.

STORAGE=	900.	940.	980.	998.	1000.	1018.	1060.	1150.	1245.	1350.
OUTFLOW=	0.	40.	90.	135.	190.	210.	910.	2875.	5550.	8800.

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	809.	271.	217.	217.	0.40
ROUTED TO	1	156.	93.	75.	75.	0.40



RESERVOIR

DRAWDOWN

COMPUTATIONS

BEAR SWAMP #1 & #2

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - NEW JERSEY (STATE) SHEET NO. 1 OF
BEAR SWAMP DAM #2 JOB NO. 1211-001-1
RESERVOIR DRAW DOWN STUDY BY KLB DATE 9-19-78

a) DISCHARGE VS. HEAD

$Q = 0.43\ A\ \sqrt{2gH} = 1.20\sqrt{H}$ BEAR SWAMP #1
$Q = 0.572\ A\ \sqrt{2gH} = 3.61\sqrt{H}$ BEAR SWAMP #2

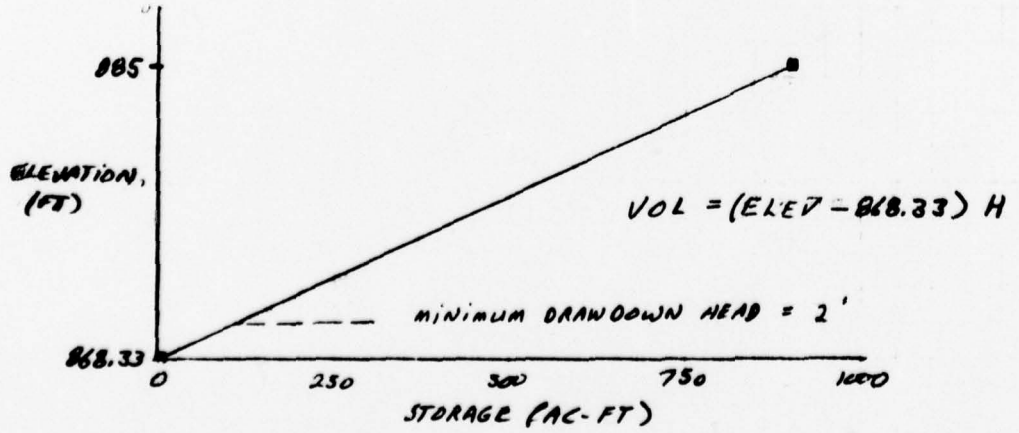
SEE NOTES FOR OUTLET RATING CURVES

b) STORAGE VS. HEAD

ASSUME A STRAIGHT LINE RELATIONSHIP.

FROM NORMAL WATER SURFACE VOLUME
TO ZERO VOLUME AT ZERO HEAD

	ELEV (FT)	HEAD (FT)	STORAGE (AC-FT)
NWS.	885	16.67	900
	868.33	0	0

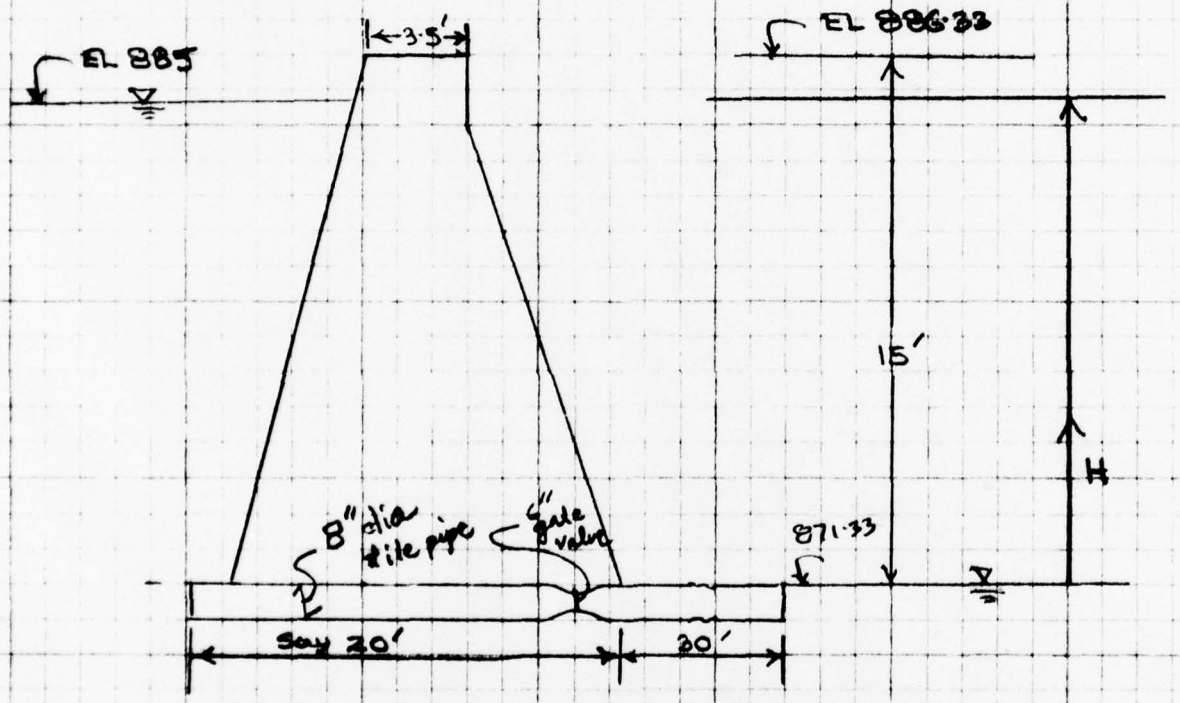


c) INFLOW; DRAINAGE AREA = 0.4 SQ. MI.

INFLOW = 2 CFS/SQ. MI. X 0.4 SQ. MI = 0.8 CFS.

BEAR SWAMP LAKE DAM #1

OUTLET RATING CURVE



Note: All the dimensions and invert elevations are assumed numbers, these figures may be far off from actual dimensions and elevations.

Outlet Discharges:

Assume: $K_e = 0.5$, $K_{valve} = 0.19$

$\epsilon = 0.01$ ft & Complete turbulence

$$H = \left[K_e + K_{valve}\left(\frac{d_2}{d_1}\right)^4 + \frac{fL}{d_2} + 1\right]\frac{V^2}{2g} \quad ; \quad \begin{matrix} d_2 = 8'' \\ d_1 = 6'' \end{matrix}$$

$$\frac{\epsilon}{d_2} = \frac{0.01}{8/12} = 0.015 \Rightarrow f = 0.044$$

$$\therefore H = \left[0.5 + 0.19\left(\frac{8}{6}\right)^4 + \frac{0.044 \times 50}{8/12} + 1\right] \frac{V^2}{2g}$$

$$= \left[0.5 + 0.60 + 3.30 + 1\right] \frac{V^2}{2g}$$

$$= 5.40 \frac{V^2}{2g}$$

$$\therefore V = 0.43\sqrt{2gH}$$

$$\therefore Q = 0.43 A \sqrt{2gH}$$

ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - NEW JERSEY STATE SHEET NO. 3 OF
BEAR SWAMP LAKE DAM #1 JOB NO. 1211-001-1
OUTLET RATING CURVE BY KLB DATE 9-20-78

RESERVOIR POOL ELEVATION (FT)	HEAD H (FT)	DISCHARGE $Q = 0.43A\sqrt{2gH}$ $= 1.20\sqrt{H}$	REMARKS
871.33	0	0	
872.33	1	1.20	
873.33	2	1.70	
874.33	3	2.08	
875.33	4	2.40	
876.33	5	2.68	
877.33	6	2.94	
878.33	7	3.17	
879.33	8	3.39	
880.33	9	3.60	
881.33	10	3.79	
882.33	11	3.98	
883.33	12	4.16	
885.00	13.67	4.44	SPILLWAY CREST EL.

ECI-4 ENGINEERING CONSULTANTS, INC.

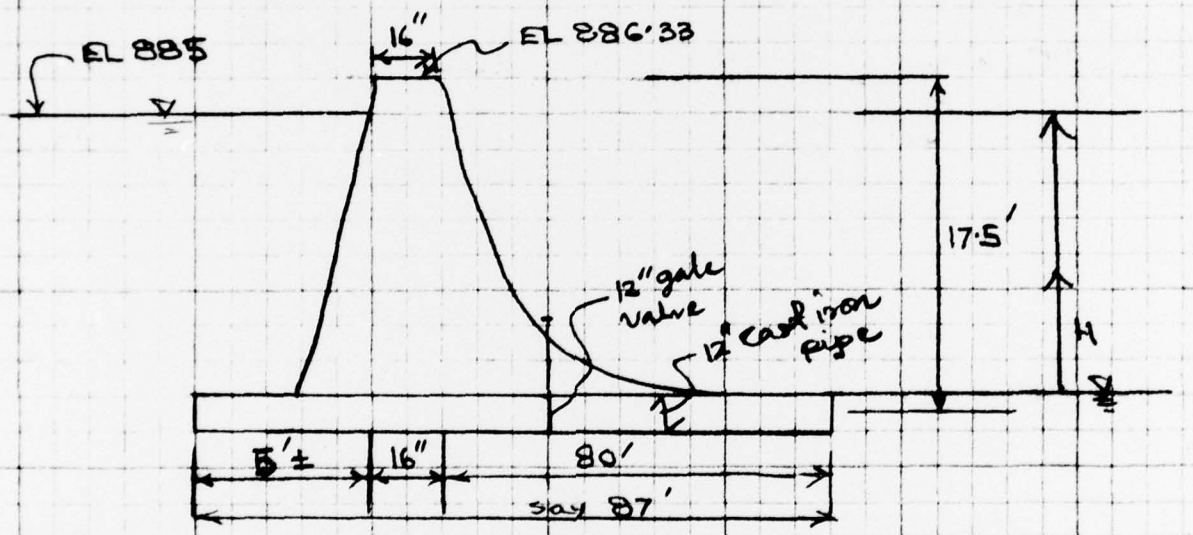
DAM SAFETY INSPECTION/NEW JERSEY (STATE) SHEET NO. 1 OF

BEAR SWAMP LAKE DAM #2 JOB NO. 1211-001

OUTLET RATING CURVE BY MAS DATE 9/19/78

BEAR SWAMP LAKE DAM #2

OUTLET RATING CURVE



Note: All the dimensions are assumed dimension they may be far off from actual dimensions.

Outlet Discharges:

Assume: $K_e = 0.5$, $K_{valve} = 0.19$ (fully open)
$\epsilon = 0.00085$, and complete turbulence

$\frac{\epsilon}{D} = 0.00085 \Rightarrow f = 0.0158$ (rough pipe, complete turbulence)

$$H = \left(K_e + K_{valve} + \frac{fL}{D} + 1\right)\frac{V^2}{2g}$$

$$= \left(0.5 + 0.19 + \frac{0.0158 \times 87}{1} + 1\right)\frac{V^2}{2g}$$

$$= 3.06\,\frac{V^2}{2g}$$

CI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION / NEW JERSEY STATE SHEET NO. 2 OF
BEAR SWAMP LAKE DAM #2 JOB NO. 1211-001
OUTLET RATING CURVE BY MAS DATE 9/19/78

$\therefore V = 0.572\sqrt{2gH}$

$\therefore Q = 0.572 A\sqrt{2gH}$

Upstream Water Surface elev. (ft)	Downstream Water Surface elev. (ft)	Head H, (ft)	Discharge, $Q = 0.572A\sqrt{2gH} = 3.61\sqrt{H}$ cfs	Remarks
870.33	869.33	1	3.61	
871.33	869.33	2	5.11	ZERO HEAD FOR OUTLET #1
872.33	869.33	3	6.25	
873.33	869.33	4	7.22	
874.33	869.33	5	8.07	
875.33	869.33	6	8.84	
876.33	869.33	7	9.55	
877.33	869.33	8	10.21	
878.33	869.33	9	10.83	
879.33	869.33	10	11.42	
880.33	869.33	11	11.97	
881.33	869.33	12	12.51	
882.33	869.33	13	13.02	
883.33	869.33	14	13.51	
885	869.33	15.67	14.29	SPILLWAY CREST EL.

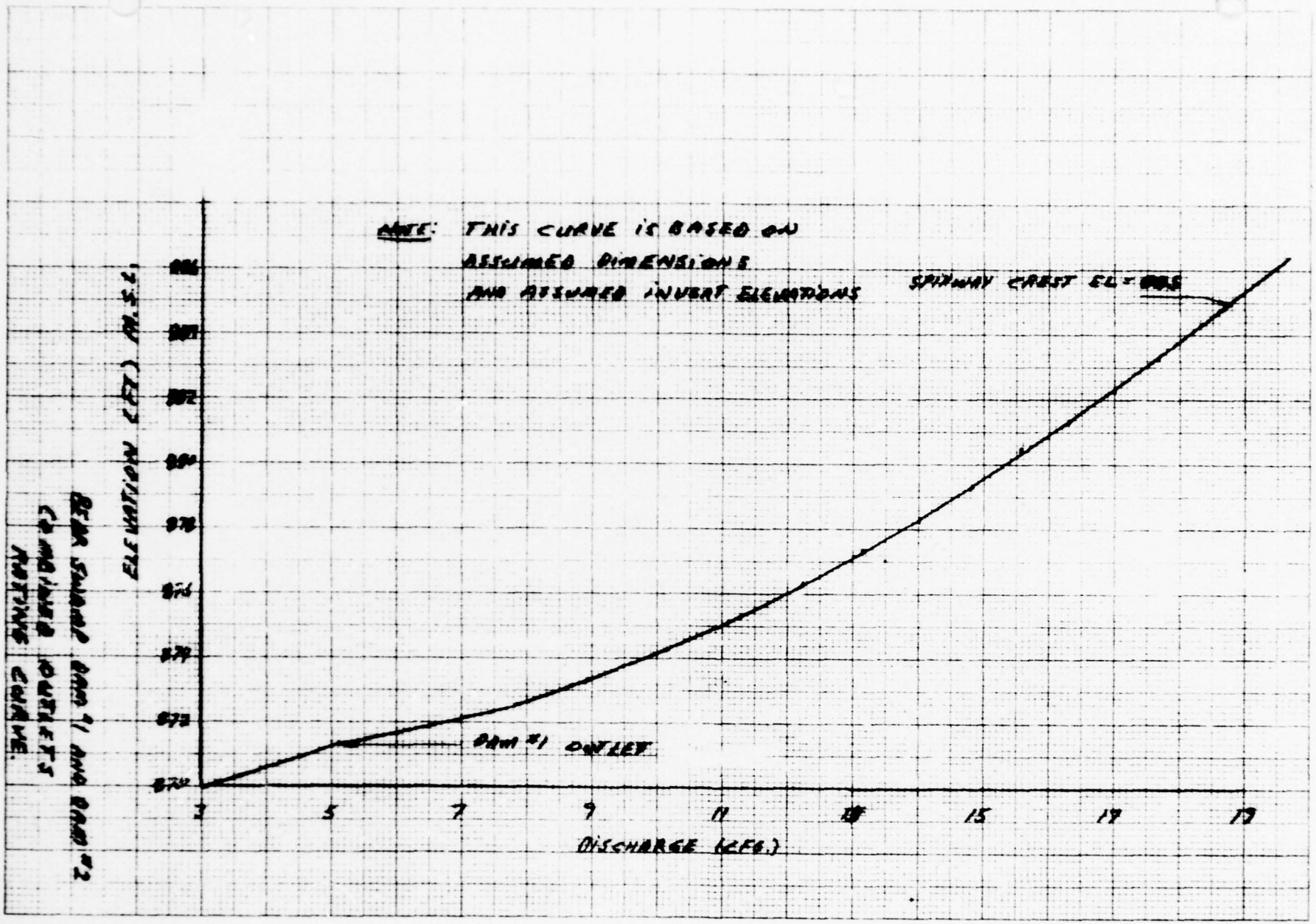
ECI-4 ENGINEERING CONSULTANTS, INC.

DAM SAFETY INSPECTION - NEW JERSEY (STATE) SHEET NO. 2 OF

BEAR SWAMP DAM #1 AND #2 JOB NO. 124

COMBINED OUTLET RATING CURVE BY KLB DATE 9-30-78

BEAR SWAMP LAKE ELEVATION (FT)	DAM #1 OUTLET DISCHARGE (CFS)	DAM #2 OUTLET DISCHARGE (CFS)	COMBINED OUTLETS DISCHARGE (CFS)	REMARKS
870.33	—	3.61	3.61	
871.33	0	5.11	5.11	
872.33	1.20	6.25	7.45	
873.33	1.70	7.22	8.92	
874.33	2.08	8.07	10.15	
875.33	2.40	8.84	11.24	
876.33	2.68	9.55	12.23	
877.33	2.94	10.21	13.15	
878.33	3.17	10.83	14.00	
879.33	3.39	11.42	14.81	
880.33	3.60	11.97	15.57	
881.33	3.79	12.51	16.30	
882.33	3.98	13.02	17.00	
883.33	4.16	13.51	17.67	
885.00	4.44	14.29	18.73	SPILLWAY CREST EL.


NOTE: THIS CURVE IS BASED ON ASSUMED DIMENSIONS AND ASSUMED INVERT ELEVATIONS
SPILLWAY CREST EL = 886.5
DAM #1 OUTLET
ELEVATION (FT.) M.S.L.
DISCHARGE (CFS.)
3
5
7
9
11
13
15
17
19
REAR SPILLWAY DAM #1 AND DAM #2 COMBINED OUTLETS ROUTING CURVE.

FLOOD ROUTING STUDY
****

BEAR SWAMP LAKE DAM 1 AND DAM 2 DRAWDOWN STUDY (DA = 0.4 SQ. MI.)

MAXIMUM OPERATION LEVEL AT ELEV 485.00 FT (FROM OPERATI
MINIMUM OPERATION LEVEL AT ELEV 470.33 FT

ROUTING STARTS AT ELEV 485.00 FT. ENDS AT ELEV 470.33 FT

TIME		AVG.INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
0	0		485.00			
		0.				
0	6		484.82	0.	0.	19.
		0.				
0	12		484.64	0.	0.	19.
		0.				
0	18		484.47	0.	0.	18.
		0.				
1	0		484.29	0.	0.	18.
		0.				
1	6		484.11	0.	0.	18.
		0.				
1	12		483.94	0.	0.	18.
		0.				
1	18		483.77	0.	0.	18.
		0.				
2	0		483.60	0.	0.	18.
		0.				
2	6		483.42	0.	0.	18.
		0.				
2	12		483.25	0.	0.	18.
		0.				
2	18		483.09	0.	0.	18.
		0.				
3	0		482.92	0.	0.	17.
		0.				
3	6		482.75	0.	0.	17.
		0.				
3	12		482.59	0.	0.	17.
		0.				
3	18		482.42	0.	0.	17.
		0.				
4	0		482.26	0.	0.	17.
		0.				
4	6		482.10	0.	0.	17.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
4	12	0.	481.94	0.	0.	17.
4	18	0.	481.78	0.	0.	17.
5	0	0.	481.62	0.	0.	17.
5	6	0.	481.46	0.	0.	16.
5	12	0.	481.30	0.	0.	16.
5	18	0.	481.15	0.	0.	16.
6	0	0.	480.99	0.	0.	16.
6	6	0.	480.84	0.	0.	16.
6	12	0.	480.69	0.	0.	16.
6	18	0.	480.53	0.	0.	16.
7	0	0.	480.38	0.	0.	16.
7	6	0.	480.23	0.	0.	15.
7	12	0.	480.09	0.	0.	15.
7	18	0.	479.94	0.	0.	15.
8	0	0.	479.79	0.	0.	15.
8	6	0.	479.65	0.	0.	15.
8	12	0.	479.50	0.	0.	15.
8	18	0.	479.36	0.	0.	15.
9	0	0.	479.22	0.	0.	15.
9	6	0.	479.08	0.	0.	15.
9	12	0.	478.94	0.	0.	14.
9	18	0.	478.80	0.	0.	14.
10	0		478.66	0.	0.	14.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		0.				
10	6		478.52	0.	0.	14.
		0.				
10	12		478.39	0.	0.	14.
		0.				
10	18		478.25	0.	0.	14.
		0.				
11	0		478.12	0.	0.	14.
		0.				
11	6		477.99	0.	0.	14.
		0.				
11	12		477.86	0.	0.	14.
		0.				
11	18		477.73	0.	0.	13.
		0.				
12	0		477.60	0.	0.	13.
		0.				
12	6		477.47	0.	0.	13.
		0.				
12	12		477.34	0.	0.	13.
		0.				
12	18		477.22	0.	0.	13.
		0.				
13	0		477.09	0.	0.	13.
		0.				
13	6		476.97	0.	0.	13.
		0.				
13	12		476.85	0.	0.	13.
		0.				
13	18		476.73	0.	0.	13.
		0.				
14	0		476.61	0.	0.	12.
		0.				
14	6		476.49	0.	0.	12.
		0.				
14	12		476.37	0.	0.	12.
		0.				
14	18		476.25	0.	0.	12.
		0.				
15	0		476.13	0.	0.	12.
		0.				
15	6		476.02	0.	0.	12.
		0.				
15	12		475.90	0.	0.	12.
		0.				
15	18		475.79	0.	0.	12.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
16	0	0.	475.68	0.	0.	12.
16	6	0.	475.57	0.	0.	11.
16	12	0.	475.46	0.	0.	11.
16	18	0.	475.35	0.	0.	11.
17	0	0.	475.24	0.	0.	11.
17	6	0.	475.14	0.	0.	11.
17	12	0.	475.03	0.	0.	11.
17	18	0.	474.93	0.	0.	11.
18	0	0.	474.82	0.	0.	11.
18	6	0.	474.72	0.	0.	11.
18	12	0.	474.62	0.	0.	10.
18	18	0.	474.52	0.	0.	10.
19	0	0.	474.42	0.	0.	10.
19	6	0.	474.32	0.	0.	10.
19	12	0.	474.23	0.	0.	10.
19	18	0.	474.13	0.	0.	10.
20	0	0.	474.04	0.	0.	10.
20	6	0.	473.94	0.	0.	10.
20	12	0.	473.85	0.	0.	10.
20	18	0.	473.76	0.	0.	9.
21	0	0.	473.67	0.	0.	9.
21	6	0.	473.58	0.	0.	9.
21	12	0.	473.49	0.	0.	9.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		0.				
21	18		473.40	0.	0.	9.
		0.				
22	0		473.32	0.	0.	9.
		0.				
22	6		473.23	0.	0.	9.
		0.				
22	12		473.15	0.	0.	9.
		0.				
22	18		473.06	0.	0.	9.
		0.				
23	0		472.98	0.	0.	9.
		0.				
23	6		472.90	0.	0.	8.
		0.				
23	12		472.82	0.	0.	8.
		0.				
23	18		472.74	0.	0.	8.
		0.				
24	0		472.66	0.	0.	8.
		0.				
24	6		472.59	0.	0.	8.
		0.				
24	12		472.51	0.	0.	8.
		0.				
24	18		472.44	0.	0.	8.
		0.				
25	0		472.37	0.	0.	8.
		0.				
25	6		472.29	0.	0.	7.
		0.				
25	12		472.22	0.	0.	7.
		0.				
25	18		472.16	0.	0.	7.
		0.				
26	0		472.09	0.	0.	7.
		0.				
26	6		472.03	0.	0.	7.
		0.				
26	12		471.96	0.	0.	6.
		0.				
26	18		471.90	0.	0.	6.
		0.				
27	0		471.84	0.	0.	6.
		0.				
27	6		471.78	0.	0.	6.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		0.				
27	12		471.72	0.	0.	6.
		0.				
27	18		471.67	0.	0.	6.
		0.				
28	0		471.61	0.	0.	6.
		0.				
28	6		471.56	0.	0.	6.
		0.				
28	12		471.51	0.	0.	5.
		0.				
28	18		471.45	0.	0.	5.
		0.				
29	0		471.40	0.	0.	5.
		0.				
29	6		471.35	0.	0.	5.
		0.				
29	12		471.30	0.	0.	5.
		0.				
29	18		471.26	0.	0.	5.
		0.				
30	0		471.21	0.	0.	5.
		0.				
30	6		471.16	0.	0.	5.
		0.				
30	12		471.12	0.	0.	5.
		0.				
30	18		471.07	0.	0.	5.
		0.				
31	0		471.03	0.	0.	5.
		0.				
31	6		470.98	0.	0.	4.
		0.				
31	12		470.94	0.	0.	4.
		0.				
31	18		470.90	0.	0.	4.
		0.				
32	0		470.86	0.	0.	4.
		0.				
32	6		470.82	0.	0.	4.
		0.				
32	12		470.78	0.	0.	4.
		0.				
32	18		470.74	0.	0.	4.
		0.				
33	0		470.70	0.	0.	4.

FLOOD ROUTING STUDY
****

TIME		AVG.INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		0.				
33	6		470.66	0.	0.	4.
		0.				
33	12		470.62	0.	0.	4.
		0.				
33	18		470.58	0.	0.	4.
		0.				
34	0		470.54	0.	0.	4.
		0.				
34	6		470.51	0.	0.	4.
		0.				
34	12		470.47	0.	0.	4.
		0.				
34	13		470.43	0.	0.	4.
		0.				
35	0		470.40	0.	0.	4.
		0.				
35	6		470.36	0.	0.	4.

****

RESERVOIR ELEVATION WENT UNDER MINIMUM WATERSURFACE ELEVATION
AFTER 35 DAYS AND 6 HOURS.

TOTAL INFLOW VOLUME	0.	ACFT
TOTAL DISCHARGE VOLUME	790.	ACFT
MAXIMUM WATER SURFACE ELEVATION	485.00	FT
MAXIMUM DISCHARGE THRU OUTLET	19.	CFS
MAXIMUM TOTAL INFLOW	0.	CFS
MAXIMUM TOTAL DISCHARGE	19.	CFS

FLOOD ROUTING STUDY
****

BEAR SWAMP LAKE DAM 1 AND DAM 2 DRAWDOWN STUDY (DA = 0.4 SQ. MI.)

MAXIMUM OPERATION LEVEL AT ELEV 485.00 FT (FROM OPERAT
MINIMUM OPERATION LEVEL AT ELEV 470.33 FT

ROUTING STARTS AT ELEV 485.00 FT. ENDS AT ELEV 470.33 FT

TIME		AVG.INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
0	0		485.00			
		1.				
0	6		484.83	0.	0.	19.
		1.				
0	12		484.66	0.	0.	19.
		1.				
0	18		484.49	0.	0.	18.
		1.				
1	0		484.32	0.	0.	18.
		1.				
1	6		484.15	0.	0.	18.
		1.				
1	12		483.99	0.	0.	18.
		1.				
1	18		483.82	0.	0.	18.
		1.				
2	0		483.66	0.	0.	18.
		1.				
2	6		483.49	0.	0.	18.
		1.				
2	12		483.33	0.	0.	18.
		1.				
2	18		483.17	0.	0.	18.
		1.				
3	0		483.01	0.	0.	17.
		1.				
3	6		482.85	0.	0.	17.
		1.				
3	12		482.69	0.	0.	17.
		1.				
3	18		482.53	0.	0.	17.
		1.				
4	0		482.38	0.	0.	17.
		1.				
4	6		482.22	0.	0.	17.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
4	12	1.	482.07	0.	0.	17.
4	18	1.	481.91	0.	0.	17.
5	0	1.	481.76	0.	0.	17.
5	6	1.	481.61	0.	0.	16.
5	12	1.	481.46	0.	0.	16.
5	18	1.	481.31	0.	0.	16.
6	0	1.	481.16	0.	0.	16.
6	6	1.	481.01	0.	0.	16.
6	12	1.	480.87	0.	0.	16.
6	18	1.	480.72	0.	0.	16.
7	0	1.	480.58	0.	0.	16.
7	6	1.	480.44	0.	0.	16.
7	12	1.	480.29	0.	0.	16.
7	18	1.	480.15	0.	0.	15.
8	0	1.	480.01	0.	0.	15.
8	6	1.	479.87	0.	0.	15.
8	12	1.	479.74	0.	0.	15.
8	18	1.	479.60	0.	0.	15.
9	0	1.	479.46	0.	0.	15.
9	6	1.	479.33	0.	0.	15.
9	12	1.	479.19	0.	0.	15.
9	18	1.	479.06	0.	0.	15.
10	0	1.	478.93	0.	0.	14.

FLOOD ROUTING STUDY
****

TIME		AVG.INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		1.				
10	6		478.80	0.	0.	14.
		1.				
10	12		478.67	0.	0.	14.
		1.				
10	18		478.54	0.	0.	14.
		1.				
11	0		478.41	0.	0.	14.
		1.				
11	6		478.28	0.	0.	14.
		1.				
11	12		478.16	0.	0.	14.
		1.				
11	18		478.03	0.	0.	14.
		1.				
12	0		477.91	0.	0.	14.
		1.				
12	6		477.79	0.	0.	14.
		1.				
12	12		477.66	0.	0.	13.
		1.				
12	18		477.54	0.	0.	13.
		1.				
13	0		477.42	0.	0.	13.
		1.				
13	6		477.31	0.	0.	13.
		1.				
13	12		477.19	0.	0.	13.
		1.				
13	18		477.07	0.	0.	13.
		1.				
14	0		476.95	0.	0.	13.
		1.				
14	6		476.84	0.	0.	13.
		1.				
14	12		476.73	0.	0.	13.
		1.				
14	18		476.61	0.	0.	12.
		1.				
15	0		476.50	0.	0.	12.
		1.				
15	6		476.39	0.	0.	12.
		1.				
15	12		476.28	0.	0.	12.
		1.				
15	18		476.17	0.	0.	12.

TIME		AVG.INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		1.				
16	0		476.06	0.	0.	12.
		1.				
16	6		475.96	0.	0.	12.
		1.				
16	12		475.85	0.	0.	12.
		1.				
16	18		475.75	0.	0.	12.
		1.				
17	0		475.64	0.	0.	12.
		1.				
17	6		475.54	0.	0.	11.
		1.				
17	12		475.44	0.	0.	11.
		1.				
17	18		475.34	0.	0.	11.
		1.				
18	0		475.24	0.	0.	11.
		1.				
18	6		475.14	0.	0.	11.
		1.				
18	12		475.04	0.	0.	11.
		1.				
18	18		474.94	0.	0.	11.
		1.				
19	0		474.85	0.	0.	11.
		1.				
19	6		474.75	0.	0.	11.
		1.				
19	12		474.66	0.	0.	11.
		1.				
19	18		474.57	0.	0.	10.
		1.				
20	0		474.47	0.	0.	10.
		1.				
20	6		474.38	0.	0.	10.
		1.				
20	12		474.29	0.	0.	10.
		1.				
20	18		474.20	0.	0.	10.
		1.				
21	0		474.12	0.	0.	10.
		1.				
21	6		474.03	0.	0.	10.
		1.				
21	12		473.94	0.	0.	10.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
21	18	1.	473.86	0.	0.	10.
22	0	1.	473.77	0.	0.	9.
22	6	1.	473.69	0.	0.	9.
22	12	1.	473.61	0.	0.	9.
22	18	1.	473.53	0.	0.	9.
23	0	1.	473.45	0.	0.	9.
23	6	1.	473.37	0.	0.	9.
23	12	1.	473.29	0.	0.	9.
23	18	1.	473.21	0.	0.	9.
24	0	1.	473.14	0.	0.	9.
24	6	1.	473.06	0.	0.	9.
24	12	1.	472.99	0.	0.	9.
24	18	1.	472.91	0.	0.	8.
25	0	1.	472.84	0.	0.	8.
25	6	1.	472.77	0.	0.	8.
25	12	1.	472.70	0.	0.	8.
25	18	1.	472.63	0.	0.	8.
26	0	1.	472.56	0.	0.	8.
26	6	1.	472.49	0.	0.	8.
26	12	1.	472.43	0.	0.	8.
26	18	1.	472.36	0.	0.	8.
27	0	1.	472.30	0.	0.	7.
27	6	1.	472.24	0.	0.	7.

FLOOD ROUTING STUDY
****

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
27	12	1.	472.18	0.	0.	7.
27	18	1.	472.12	0.	0.	7.
28	0	1.	472.06	0.	0.	7.
28	6	1.	472.00	0.	0.	7.
28	12	1.	471.95	0.	0.	6.
28	18	1.	471.89	0.	0.	6.
29	0	1.	471.84	0.	0.	6.
29	6	1.	471.79	0.	0.	6.
29	12	1.	471.74	0.	0.	6.
29	18	1.	471.69	0.	0.	6.
30	0	1.	471.64	0.	0.	6.
30	6	1.	471.60	0.	0.	6.
30	12	1.	471.55	0.	0.	6.
30	18	1.	471.51	0.	0.	5.
31	0	1.	471.46	0.	0.	5.
31	6	1.	471.42	0.	0.	5.
31	12	1.	471.37	0.	0.	5.
31	18	1.	471.33	0.	0.	5.
32	0	1.	471.29	0.	0.	5.
32	6	1.	471.25	0.	0.	5.
32	12	1.	471.21	0.	0.	5.
32	18	1.	471.17	0.	0.	5.
33	0	1.	471.13	0.	0.	5.

TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
		1.				
33	6		471.10	0.	0.	5.
		1.				
33	12		471.06	0.	0.	5.
		1.				
33	18		471.02	0.	0.	5.
		1.				
34	0		470.99	0.	0.	5.
		1.				
34	6		470.95	0.	0.	4.
		1.				
34	12		470.92	0.	0.	4.
		1.				
34	18		470.88	0.	0.	4.
		1.				
35	0		470.85	0.	0.	4.
		1.				
35	6		470.82	0.	0.	4.
		1.				
35	12		470.78	0.	0.	4.
		1.				
35	18		470.75	0.	0.	4.
		1.				
36	0		470.72	0.	0.	4.
		1.				
36	6		470.69	0.	0.	4.
		1.				
36	12		470.66	0.	0.	4.
		1.				
36	18		470.63	0.	0.	4.
		1.				
37	0		470.60	0.	0.	4.
		1.				
37	6		470.57	0.	0.	4.
		1.				
37	12		470.54	0.	0.	4.
		1.				
37	18		470.51	0.	0.	4.
		1.				
38	0		470.48	0.	0.	4.
		1.				
38	6		470.45	0.	0.	4.
		1.				
38	12		470.42	0.	0.	4.
		1.				
38	18		470.39	0.	0.	4.

FLOOD ROUTING STUDY
****

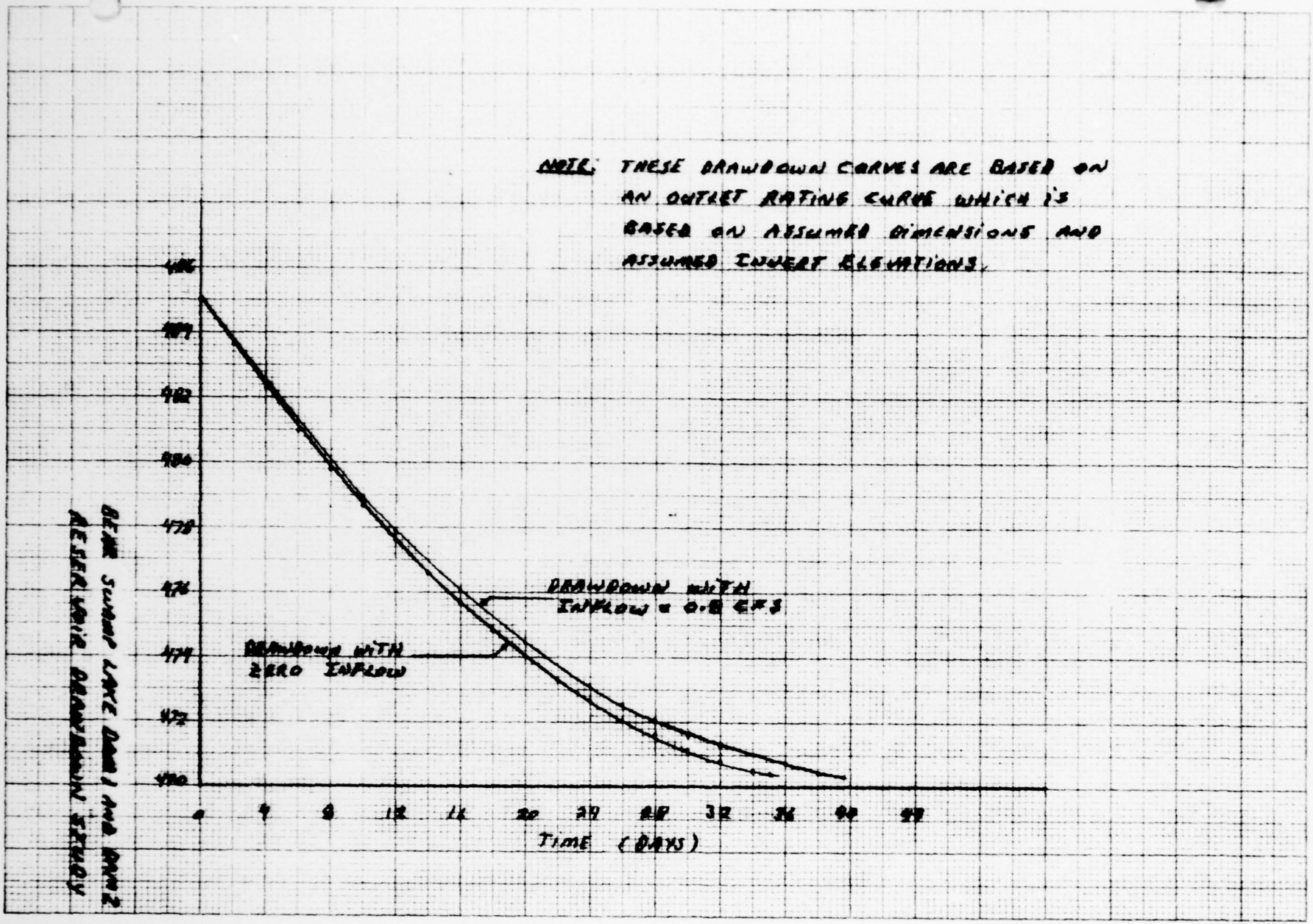
TIME		AVG. INFLOW	RESERVOIR EL	MAIN SPILLWAY DISCHARGE	OVERFLOW SPILLWAY DISCHARGE	OUTLET DISCHARGE
DAY	HR	CFS	FT	CFS	CFS	CFS
39	0	1.	470.37	0.	0.	4.
39	6	1.	470.34	0.	0.	4.

****

RESERVOIR ELEVATION WENT UNDER MINIMUM WATERSURFACE ELEVATION
AFTER 39 DAYS AND 6 HOURS

TOTAL INFLOW VOLUME	65.	ACFT
TOTAL DISCHARGE VOLUME	857.	ACFT
MAXIMUM WATER SURFACE ELEVATION	485.00	FT
MAXIMUM DISCHARGE THRU OUTLET	19.	CFS
MAXIMUM TOTAL INFLOW	1.	CFS
MAXIMUM TOTAL DISCHARGE	19.	CFS

NOTE: THESE DRAWDOWN CURVES ARE BASED ON AN OUTLET RATING CURVE WHICH IS BASED ON ASSUMED DIMENSIONS AND ASSUMED INVERT ELEVATIONS.



APPENDIX E

STABILITY CALCULATIONS

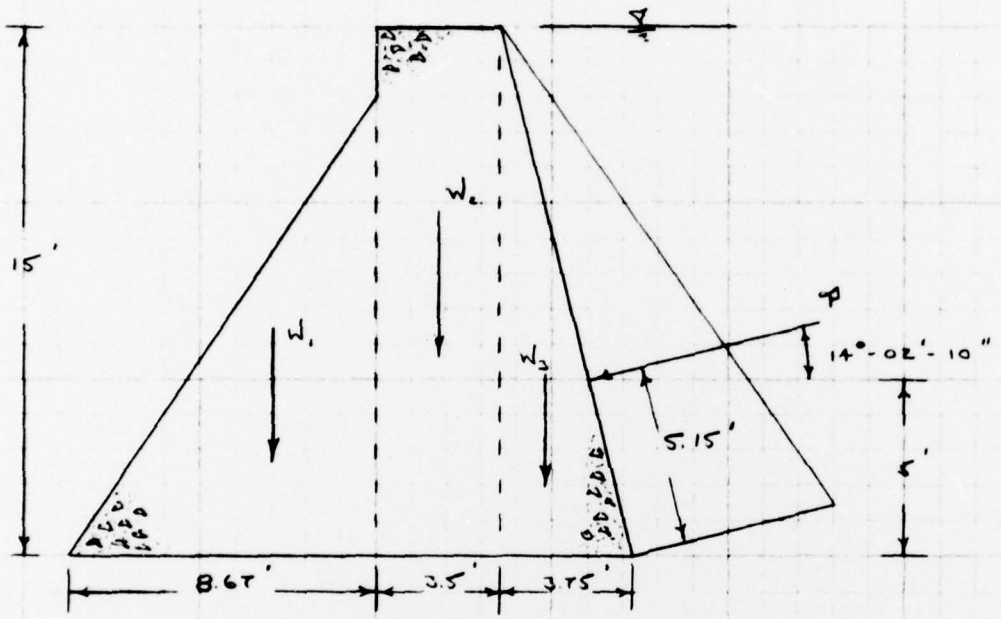
ECI-4 **ENGINEERING CONSULTANTS, INC.**

BEAR SWAMP LAKE DAM # 1 — SHEET NO. 1 OF 5

STABILITY CALCULATIONS — JOB NO. 1212

NEW JERSEY DAM SAFETY INSPECTION GROUP II — BY JTK DATE 8-9-78

ASSUME WATER SURFACE AT CREST



$W_1 = \frac{1}{2}(8.6T\ ft)(13\ ft)(150\ lb/ft^3)$
$= 8453.25\ lb/ft$

$W_2 = 15\ ft(3.5\ ft)(150\ lb/ft^3)$
$= 7875\ lb/ft$

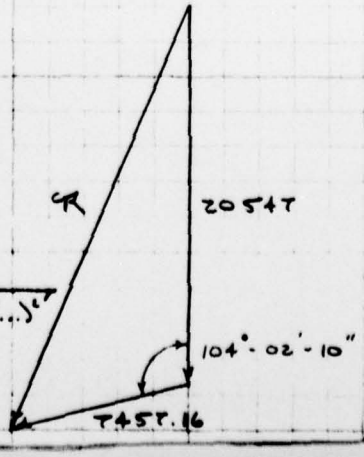
$W_3 = \frac{1}{2}(3.75\ ft)(15\ ft)(150\ lb/ft^3)$
$= 4218.75\ lb/ft$

$W_{TOT} = W_1 + W_2 + W_3$
$= 20547\ lb/ft$

$\Phi = \frac{1}{2}(62.4\ lb/ft^3)(15.46\ ft)^2$
$= 7457.16\ lb/ft$

RESULTANT = 23497.07 lb/ft ∠ 72°-04'-04" FROM GEOMETRY @ RIGHT

CHECK $R = \sqrt{(20547 + 7457.16 \sin 14°-02'-10")^2 + (7457.16 \cos 14°..)^2}$
$= 23497.07\ lb/ft$



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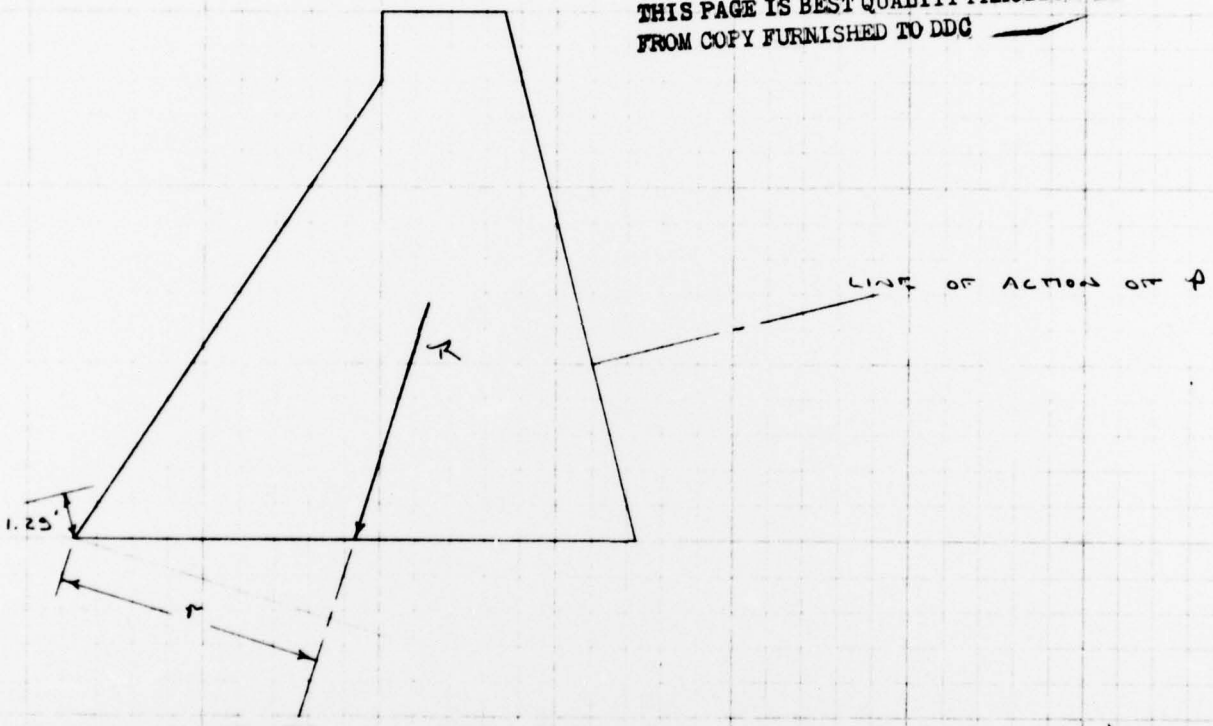


SUMMING MOMENTS ABOUT THE TOE OF THE DAM + ↻

M_o = 8453.25 #/ft (5.78 ft) + 7875 #/ft (10.42 ft) + 4218.75 #/ft (13.42 ft) − (7457.16 #/ft × 1.29 ft)

= 177913.17 ft #/ft ↻

f = 177913.17 ft #/ft / 23497.07 #/ft

= 7.57 ft

LOCATION OF RESULTANT AT BASE (X = DISTANCE FROM TOE)

X = 7.57 ft / cos 17°-55'-56"

= 7.96

(FALLS WITHIN MIDDLE THIRD)

$\frac{1}{3}(15.92\text{ ft}) < 7.96\text{ ft} < \frac{2}{3}(15.92\text{ ft})$

$5.31\text{ ft} < 7.96\text{ ft} < 10.61\text{ ft}$

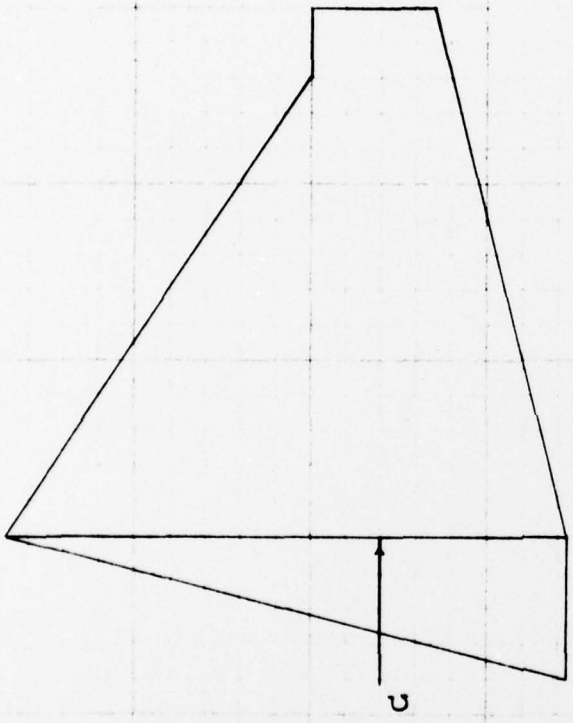
ECI-4 **ENGINEERING CONSULTANTS, INC.**

SHEET NO. 3 OF 5

JOB NO.

BY JJK DATE

SAME CASE CONSIDERING UPLIFT ASSUMING FULL HEAD LOSS ACROSS BASE



$U = \frac{1}{2}(15.92\ ft)(62.4\ lb/ft^3)(15\ ft)$

$= 7450.56\ lb/ft$

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VERTICAL COMPONENT OF RESULTANT

$R_v = 20547\ lb/ft - 7450.56\ lb/ft$

$= 13096.44$

$R_{RESULTANT} = 16568.00\ lb/ft \quad \angle 64°-06'-34"$

SUMMING MOMENTS ABOUT THE TOE OF THE DAM +↻

$M_o = 177913.17\ ft\ lb/ft - 7450.56\ lb/ft\ (10.61\ ft)$

$= 98837.89\ ft\ lb/ft$ ↻

$r = 98837.89\ ft\ lb/ft \div 16568.00\ lb/ft$

$= 5.97\ ft$

CI-4 ENGINEERING CONSULTANTS, INC.

SHEET NO. 4 OF 5

JOB NO.

BY JTK DATE

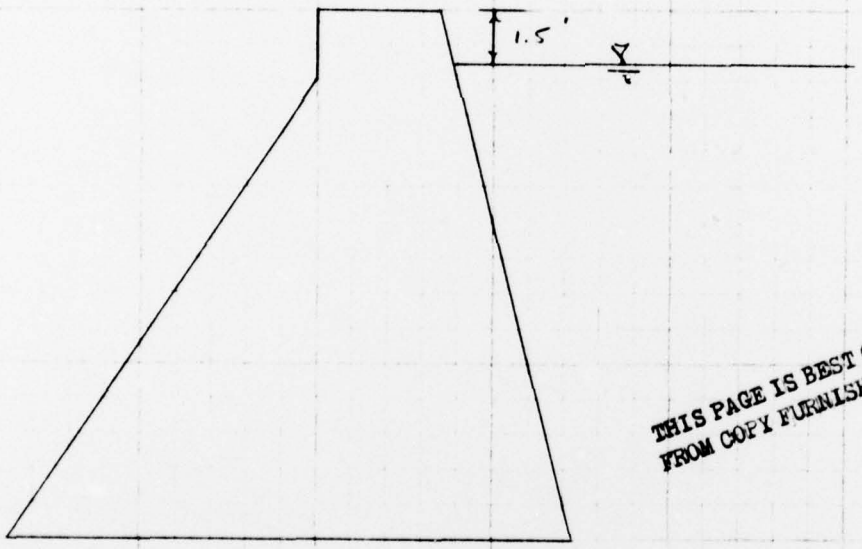
LOCATION OF RESULTANT AT BASE (x = DISTANCE FROM TOE)

$x = 5.97 \text{ ft} / \cos 25°\text{-}53'\text{-}26''$

$= 6.64 \text{ ft}$

(FALLS WITHIN MIDDLE THIRD) $5.31 \text{ ft} < 6.64 \text{ ft} < 10.61 \text{ ft}$

ICE LOADING WITH WATER SURFACE AT SPILLWAY CREST OF BEAR SWAMP LAKE DAM # 2



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ASSUME : 5000 lb HORIZONTAL THRUST DUE TO ICE

: COEFFICIENT OF FRICTION BETWEEN CONCRETE AND FOUNDATION EQUALS 0.6

TOTAL HORIZONTAL THRUST (H)

$H = 5000 \text{ lb} + \frac{1}{2}(62.4 \text{ lb/ft}^3)(13.5 \text{ ft})^2$

$= 10686.2 \text{ lb/ft}$

TOTAL VERTICAL LOAD (V) INCLUDING UPLIFT

$V = 2054 \text{ lb/ft} + \frac{1}{2}(13.5 \text{ ft})(3.38 \text{ ft})(62.4 \text{ lb/ft}^3) - \frac{1}{2}(15.92 \text{ ft})(62.4 \text{ lb/ft}^3)(13.5 \text{ ft})$

$= 15265.2 \text{ lb/ft}$

CH. ENGINEERING CONSULTANTS, INC.

SHEET NO. 5 OF 5

JOB NO.

BY JTK DATE

SAFETY FACTOR = 0.6 (15265.2 lb/ft) / 10686.2 lb/ft

= 0.86

NOTE: WHILE THE SAFETY FACTOR IS LESS THAN 1.0 THE CALCULATIONS DO NOT TAKE INTO ACCOUNT ADHESION BETWEEN CONCRETE AND FOUNDATION; SURFACE IRREGULARITIES AT THE CONTACTS; POSSIBLE KEY INTO FOUNDATION; LATERAL THRUST AT TOE DUE TO FROZEN SOIL; PASSIVE RESISTANCE AT TOE; FURTHER UPLIFT ASSUMED IS BELIEVED CONSERVATIVE SINCE NO WATER WAS OBSERVED AT TOE.

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REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER: NJ00016	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): Phase I Inspection Report National Dam Safety Program Bear Swamp Lake Dam #1 Passaic County, N.J.	5. TYPE OF REPORT & PERIOD COVERED: FINAL 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Robert Gershowitz, P.E.	8. CONTRACT OR GRANT NUMBER(s): (15) DACW61-78-C-0124
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Harris-ECI Associates 453 Amboy Ave. Woodbridge, N.J. 07095	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, Pennsylvania 19106	(11) 12. REPORT DATE: August, 1978 13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

(9) Final rept.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

(16) National Dam Safety Program. Bear Swamp Lake Dam Number 1 (NJ00016), Passaic River Basin, Bear Swamp Brook, Passaic County, New Jersey. Phase I Inspection Report.

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams--N.J.
National Dam Safety Program Phase I
Bear Swamp Lake Dam #1, N.J.
Dam Safety
Dam Inspection

(12) 135 p.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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